# RAFFERTY-ALAMEDA PROJECT

## ENVIRONMENTAL IMPACT STATEMENT

*Souris Basin Development Authority*

# CHAPTER 12

# LAND USE

# RAFFERTY/ALAMEDA ENVIRONMENTAL IMPACT STATEMENT

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# LAND USE

## INTRODUCTION

The rural landscape reflects the economic activities carried on in the area. It can be viewed as having a foundation made up of a pattern of agricultural land use which has been complemented by other activities where resources and economics have so dictated. Superimposed on this system of land uses is a transportation system which has evolved to accommodate the types and volumes of flows within the region. The following discussion has the objective of defining the land use pattern in the Study Area, its major determinants and components. Some of the elements discussed add to topics introduced in the section with the Social and Economic Assessment. Other topics will be further expanded in subsequent sections.

## AGRICULTURAL LAND USE

Agricultural land use data are found in agricultural statistics compiled by Saskatchewan Agriculture and Census of Canada data compiled by Statistics Canada. These data are presented by crop districts and census areas. The Study Area falls within crop districts 1 and 2 and Census Divisions 1 and 2. Because of the regional nature of this type of data, site specific data were obtained for the areas to be affected by the various developments associated with the Rafferty and Alameda reservoirs using recent air photos. Both types of data are required in order to place the impact assessment in a regional perspective.

### .1 Agricultural Resource Base

The present pattern of agriculture land use is tied directly to the physical features of the Study Area and the resulting agricultural resource values.

The physical features of the Study Area are generally oriented on a northwest-southeast diagonal pattern. The Missouri Coteau escarpment which delineates the Second and Third Prairie Steppes is found in the Southwest corner and is marked by the course of Long Creek, from Khedive to Oungre. The

Moose Mountain Upland is found in the northeast corner and is delineated by Moose Mountain Creek. The Oxbow Till Plain occupies the eastern portion from approximately Oxbow north and east of Moose Mountain Creek.

Lying between the Missouri Coteau and Moose Mountain Upland is the Souris Plain, the dominant physiographic region in the Study Area. The level and gently rolling land of the Souris Plain lies between 550 and 640 meters above sea level. The terrain becomes more undulating toward the Missouri Coteau and rises sharply to the Third Prairie Steppe with an elevation of 910 meters southwest of Big Muddy Valley. It also rises sharply at the Moose Mountain Upland with an elevation of 800 meters at the northeast part of the Study Area.

With the exception of a few small areas, the Study Area is in the Souris River Basin. The three main components of the river basin in this area are Long Creek, Souris River and Moose Mountain Creek. The general drainage features are illustrated in Figure 1.

Long Creek, in the southwest part of the Study Area flows southeast across the international border and swings north to join the Souris River just west of Estevan. Moose Mountain Creek flows across the northeast corner and the eastern part of the Study Area and joins the Souris River near Oxbow. The Souris River originates in the Yellow Grass Marsh northwest of Weyburn and flows southeast to Estevan and then east to Oxbow before swinging south to cross the Canada-U.S. border.

Other minor tributaries to the Souris River are Roughbark Creek and Short Creek. Roughbark Creek flows from west to east between the Souris River and Long Creek. It combines with Jewel Creek and joins the Souris east of Goodwater and west of Midale. Short Creek originates in the U.S. and joins the Souris at Roche Percee, southeast of Estevan.

Being typical prairie streams, the Souris River and its tributaries derive most of their annual flows from snowmelt and early spring rains. Over the years a number of lakes and reservoirs have been developed in the basin. Of the larger projects, three are on Long Creek, one on Moose Mountain Creek, three on the Souris River and one on Roughbark Creek. Table 1 outlines the water development projects in the Study Area and their principal purpose.

The Yellow Grass and Tatagwa Marshes are located in the flat bottom of a large post-glacial lake bed which have few natural runoff channels. Drainage development over the years has increased the drainage area upstream of the

FIGURE I

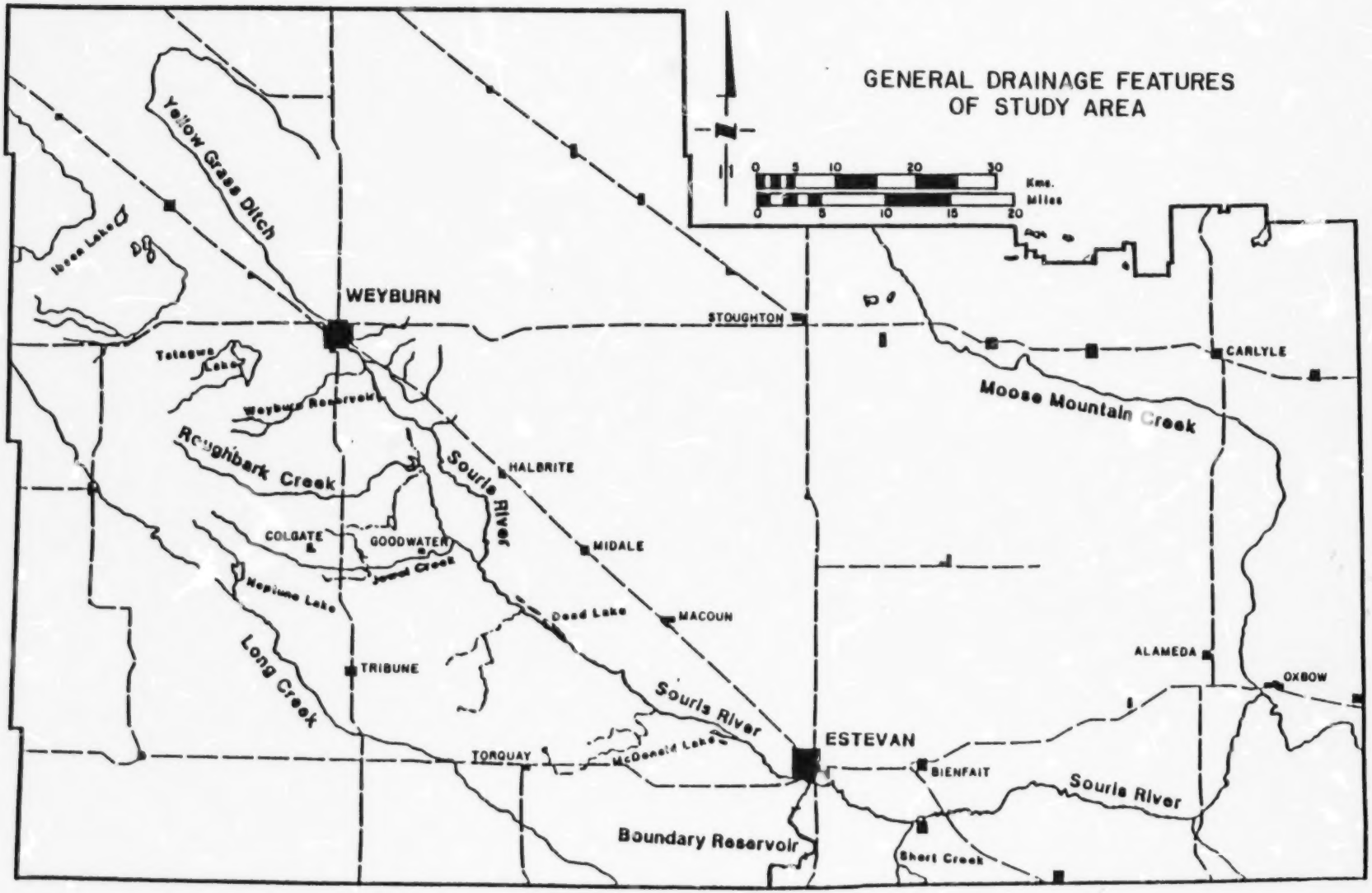

GENERAL DRAINAGE FEATURES
OF STUDY AREA
0 5 10 20 30
Kms.
0 5 10 15 20
Miles
Yellow Grass Ditch
Ibsen Lake
WEYBURN
Tetagwa Lake
Weyburn Reservoir
Roughbark Creek
Souris River
HALBRITE
COLGATE
GOODWATER
Jewell Creek
MIDALE
Neptune Lake
Dead Lake
MACOUN
Long Creek
TRIBUNE
Souris River
TORQUAY
McDonald Lake
ESTEVAN
BIENFAIT
Souris River
Boundary Reservoir
Short Creek
STOUGHTON
CARLYLE
Moose Mountain Creek
ALAMEDA
OXBOW

TABLE 1

Water Development Projects in Study Area

| Project | Year Constructed | Water Source | Storage Capacity Cubic Decametres | Acre/ Feet | Principal Purpose |
|---|---|---|---|---|---|
| Weyburn Reservoir | 1940 | Souris River | 6290 | 5100 | Municipal Water Supply |
| Roughbark Reservoir | 1937 | Roughbark Creek | 2097 | 1700 | Stockwatering & Irrigation |
| Dead Lake | 1937 | Souris River | 6906 | 5600 | Stockwatering & Irrigation |
| Maxim Lake | 1949 | Long Creek | 2713 | 2200 | Stockwatering |
| Larsen Reservoir | 1957 | Long Creek | 814 | 660 | Municipal water supply |
| Boundary Reservoir | 1958 | Long Creek | 60555 | 49100 | Cooling water for Thermal Electric Generation and Municipal Water Supply |
| Moose Mountain Lake | 1937 | Moose Mountain Creek | 11593 | 9400 | Stockwatering & Irrigation |
| Oxbow Dam | 1960 | Souris River | 419 | 340 | Recreation & Irrigation |

Note: 1 cubic decameter ($dam^3$) = .811 acre-feet or 1 acre-foot = 1.233 $dam^3$.
Source: Souris River Basin Study Report 1978

marshes. The Souris River Study Board concluded that draining the marsh area has the effect of increasing the volume of water runoff on the mainstream of the Souris but not increasing the flood peaks because the marsh runoff is delayed.

The 27 km of the Souris River Valley between the grid road west of Halbrite and Dead Lake drops 13.5 meters in elevation which is quite steep in relation to other parts of the valley. In the next 30 km downstream to the Rafferty Dam site it only drops 4 m. The river channel is small and meandering and even small flows spread out onto the flood plain in places. While the spring runoff typically floods the valley floor thereby providing beneficial irrigation, the relatively steep gradient in some reaches results in a short drainoff period.

Portions of that reach of the valley from Dead Lake to Estevan is nearly flat. The lack of relief may be explained by the deposition of sediment on the Souris flood plain by the flood water from Long Creek. This has resulted in the flattening of the floodplain above their confluence.

All land is not equally suitable for agriculture. The inherent ability of the land to support agriculture is a determining factor for the distribution of people in the open country and the general organization of the agricultural sector.

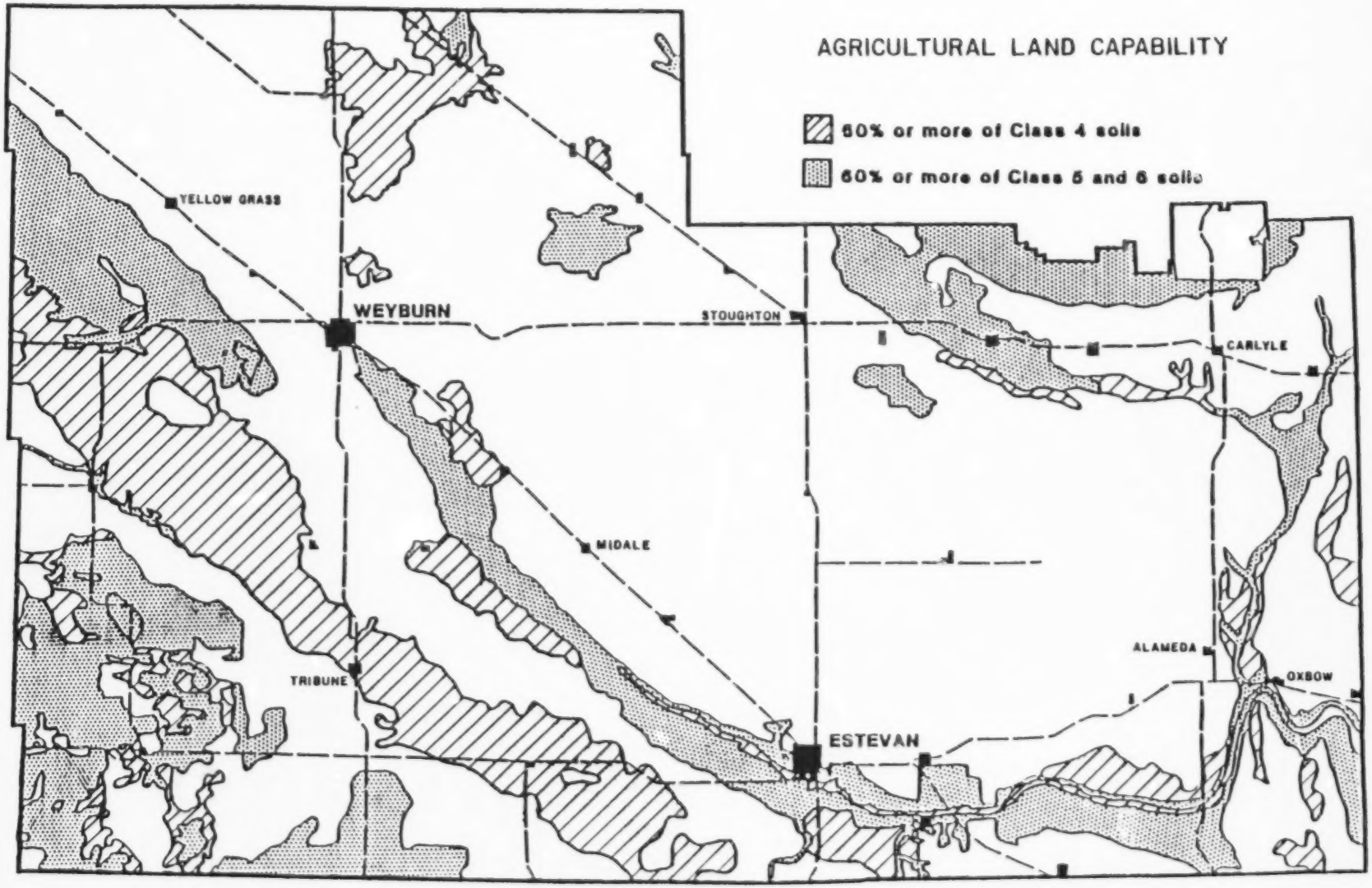
The Canada Land Inventory classifies lands according to their capability for various uses. The soil capability classification is based on the degree and kind of limitation for agricultural use and general productive capacity for common field crops.

The first three classes are considered capable of sustained production of common field crops. The fourth is marginal for sustained arable agriculture, the fifth is capable for permanent pasture and hay only, while the sixth is capable of use only for wild pasture.

The distribution of the poorer agricultural soils has been depicted by outlining those areas where there are either 60% or more of Class 4 soils (severe limitations for field crops) and where there are 60% or more of Class 5 and 6 soils (permanent pasture/hay and wild pasture). This information is displayed in Figure 2.

Generally, the course of the Souris River valley describes a band of poorer agricultural land stretching from Weyburn to Estevan and eastwards.

FIGURE 2


AGRICULTURAL LAND CAPABILITY
60% or more of Class 4 soils
60% or more of Class 5 and 6 soils
YELLOW GRASS
WEYBURN
STOUGHTON
CARLYLE
MIDALE
TRIBUNE
ALAMEDA
OXBOW
ESTEVAN

Moose Mountain Creek also coincides with a narrower band of lands with lesser potential for field crops. The lands between the Souris and Moose Mountain Creek represent the Souris Plain which is the largest body suitable for sustained arable agriculture. A broad band of poorer lands which generally has Long Creek as its southern limit is oriented from northwest to southeast like most of the physiographic features in the area. The Missouri Coteau in the southwest and the Moose Mountain Upland in the northeast have concentrations of lands not suitable for field crops.

The better agricultural lands lie to the north of the Souris River and the roughly triangular area to the south of the Souris River has significant concentrations of pasture lands. This distribution of agricultural resource values has direct implications for the region in terms of the location and extent of various agricultural phenomena.

## PRESENT AGRICULTURAL LAND USE IN THE STUDY AREA

### .1 General

The Study Area occurs in the dark brown soil zone which has developed under mixed-grass prairie communities dominated by speargrasses and wheatgrasses. These communities have developed in the semiarid climate typical of much of the southern and western Saskatchewan agricultural region. The mean annual number of degree days above 46°F is 2800 (1555 degree day above 7.78°C) (Richards and Fung 1969). Crops such as canola, which are better adapted to cooler more humid growing seasons, do not fare well in this region. Wheat has therefore become the main field crop in this area.

Due to various physiographic features, pasture areas in the region occur on lands not suitable for cultivation. The production of beef cattle is the major use of such lands. Hay crops as winter feed for cattle occur in areas where irrigation is possible or where soil is locally subjected to high moisture levels (flooding) and cannot be relied upon for other annual crop production. Areas along the Souris River valley between Estevan and Weyburn fall into these categories.

.2 Cultivated Land

In the Estevan area, as throughout the dark brown soil zone, wheat is the major cereal crop, exceeding the total average for all other field crops combined. In 1976, for example, for the four Rural Municipalities (Estevan, Cambria, Cymri and Lomond) covering the majority of the land between Estevan and Weyburn, wheat production accounted for approximately 80%, 108,812 ha (268,875 acres) of the total field crop acreage. Haylands accounted for another 9%,12,569 ha (31,059 acres) and oats and barley combined represented 8% of the total. These four crops represent 97% of the total acreage of field crops in the area.

Other crops have played minor roles in contributions to the local agricultural production. Acreages of canola increased dramatically in the general region between the years 1961 and 1971 but have declined since. In 1976 only 85 ha (210 acres) were seeded in these four Rural Municipalities. Flax and rye were of considerably greater importance, with approximately ten times the acreage of each of these seeded as compared to canola. Acreages of field crops in Rural Municipalities in the area are given in Table 2.

Trends in field crop acreages can be observed by comparing the data from the last three Canadian census records (Table 3). For the two census divisions within which the Project Area falls, wheat acreages climbed successively from 1971 to 1981. In 1981, acreage of wheat was approximately 30% higher than in 1971. Other field crops have fluctuated considerably over the ten year period.

Production from cultivated lands in the area has tended to be lower than the provincial average for all major field crops (Table 4). The lower yields are probably due principally to the climate, which tends to be hotter and drier throughout the growing season than for the more northern locations in the province. Also, the high percentage of Solonetzic soils in this region may have caused a lower crop yield than is expected for the given climatic conditions.

There has been a significant decline in cereal crop production in the Rafferty Project Area over the past few years. Between the ten year periods ending in 1980 and 1985 the Rural Municipalities of Estevan, Cymri, Cambria and Lomond experienced declines averaging 12 to 16 percent while the provincial average improved slightly. The two Rural Municipalities in the Alameda Project Area were only slightly better at two to nine percent below the provincial

TABLE 2

Acreages of Selected Field Crops on Census Farms
in the Estevan Area, 1976 in hectares (acres).

| Municipality Name | No. | Wheat | Oats | Barley | Rye | Flax | Rape | Silage Corn | Fodder Oats | Potatoes | Mixed Grain | Tame Hay |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Estevan | 5 | 22,582 | 1,932 | 578 | 417 | 330 | 24 | 34 | 178 | 4 | 215 | 4,392 |
| | | (55,801) | (4,774) | (1,428) | (1,031) | (815) | (60) | (83) | (440) | (10) | (531) | (10,852) |
| Cambria | 6 | 36,607 | 1,170 | 533 | 378 | 61 | — | — | 236 | — | — | 1,507 |
| | | (90,455) | (2,890) | (1,318) | (935) | (150) | — | — | (583) | — | — | (3,723) |
| Cymri | 36 | 26,349 | 1,580 | 1,891 | — | 184 | — | 17 | 306 | — | 42 | 4,116 |
| | | (65,108) | (3,904) | (4,673) | — | (455) | — | (40) | (756) | — | (105) | (10,171) |
| Lomond | 37 | 23,274 | 1,883 | 1,480 | 106 | 26 | 61 | 8 | 32 | — | 39 | 2,555 |
| | | (57,511) | (4,653) | (3,658) | (263) | (64) | (150) | (20) | (80) | — | (96) | (6,313) |
| TOTAL | | 108,812 | 6,565 | 4,483 | 902 | 601 | 85 | 58 | 752 | 4 | 296 | 12,569 |
| | | (268875) | (16,221) | (11,077) | (2,229) | (1484) | (210) | (143) | (1,859) | (10) | (732) | (31,059) |

Note: 1 hectare = 2.471 acres
Source: Adapted from 1976 Census of Canada, Agriculture Saskatchewan

TABLE 3

Acreages of Various Field Crops in the Study Area
in hectares (acres).

| Census* Division | Year | Wheat | Oats | Barley | Rye | Tame Hay | Flax | Rape | Mustard |
|---|---|---|---|---|---|---|---|---|---|
| | 1981 | 437,327 (1,080,636) | 44,481 (109,912) | 67,249 (166,173) | 27,138 (67,058) | 46,625 (115,210) | 18,076 (44,667) | 2,255 (5,571) | 5,642 (13,941) |
| Division 1 | 1976 | 374,020 (924,203) | 74,403 (183,851) | 46,659 (115,294) | 8,645 (21,362) | 64,858 (160,263) | 14,992 (37,045) | 1,761 (4,351) | 380 (938) |
| | 1971 | 308,081 (761,269) | 62,368 (154,111) | 125,781 (310,806) | 34,014 (84,048) | 46,257 (114,300) | 30,126 (74,442) | 8,055 (19,904) | 1,223 (3,023) |
| | 1981 | 594,049 (1,467,896) | 20,680 (51,101) | 27,994 (69,173) | 4,690 (11,588) | 30,111 (74,405) | 8,960 (22,140) | 265 (654) | 3,502 (8,653) |
| Division 2 | 1976 | 554,043 (1,369,041) | 26,638 (65,822) | 22,433 (55,432) | 2,292 (5,663) | 40,106 (99,101) | 2,843 (7,026) | 93 (231) | 622 (1,538) |
| | 1971 | 471,151 (1,164,215) | 37,186 (91,887) | 100,813 (249,109) | 13,303 (32,872) | 24,849 (61,402) | 33,571 (82,953) | 6,144 (15,183) | 4,909 (12,129) |

Adapted from 1971, 1976 and 1981 Census of Canada
*Census Division 1 includes Rural Municipalities 1-5, 31-36, 61-65, 91-95
Census Division 2 includes Rural Municipalities 6-10, 36-40, 66-70, 96-100

TABLE 4

Ten Year Average Yields of Cereal Grains by Rural Municipality
(in Kilograms per acre)
ending in 1980 and 1985

| Rural Municipality | Year | Wheat | Durum | Oats | Barley | Fall Rye | Flax | Rape (Canola) |
|---|---|---|---|---|---|---|---|---|
| Estevan #5 | 1980 | 653 | 637 | 706 | 773 | 553 | 302 | 318 |
| | 1985 | 582 | 549 | 607 | 653 | 501 | 305 | 321 |
| | % Change | -11% | -14% | -14% | -16% | -9% | 1% | 1% |
| Cambria #6 | 1980 | 686 | 728 | 823 | 620 | 333 | 391 | 664 |
| | 1985 | 623 | 632 | 698 | 542 | 301 | 316 | 607 |
| | % Change | -9% | -13% | -15% | -13% | -10% | -19% | -9% |
| Cymri #36 | 1980 | 650 | 632 | 668 | 771 | 503 | 282 | 421 |
| | 1985 | 578 | 520 | 564 | 661 | 510 | 278 | 354 |
| | % Change | -11% | -18% | -16% | -14% | 1% | -1% | -16% |
| Lomond #37 | 1980 | 648 | 645 | 672 | 751 | 511 | 296 | 329 |
| | 1985 | 561 | 555 | 594 | 651 | 406 | 250 | 283 |
| | % Change | -13% | -14% | -12% | -13% | -21% | -16% | -14% |
| Weyburn #67 | 1980 | 640 | 656 | 676 | 790 | 528 | 366 | 363 |
| | 1985 | 594 | 576 | 592 | 689 | 504 | 384 | 329 |
| | % Change | -7% | -12% | -12% | -13% | -5% | 5% | -9% |
| RAFFERTY AREA Average | | 588 | 566 | 611 | 639 | 444 | 307 | 379 |
| % Above/Below 1985 Provincial Average | | -18.7% | -8.6% | -19.4% | -30.7% | -30.0% | -25.2% | -23.2% |
| Moose Creek #33 | 1980 | 708 | 713 | 731 | 897 | 737 | 302 | 403 |
| | 1985 | 686 | 644 | 621 | 857 | 776 | 286 | 425 |
| | % Change | -3% | -10% | -15% | -4% | 5% | -5% | 5% |
| Moose Mount.#63 | 1980 | 650 | 651 | 683 | 819 | 676 | 351 | 402 |
| | 1985 | 682 | 656 | 673 | 811 | 748 | 387 | 405 |
| | % Change | 5% | 1% | -1% | -1% | 11% | 10% | 1% |
| ALAMEDA AREA Average | | 684 | 650 | 647 | 838 | 762 | 337 | 415 |
| % Above/Below 1985 Provincial Average | | -9.5% | -1.8% | -8.5% | -9.1% | 20.0% | -17.9% | -15.8% |
| Saskatchewan | 1980 | 701 | 672 | 751 | 874 | 550 | 356 | 442 |
| | 1985 | 723 | 662 | 758 | 923 | 635 | 410 | 493 |
| | % Change | 3% | 1% | 1% | 6% | 15% | 15% | 12% |

Note: To convert kilograms per acre to kilograms per hectare, multiply number by 2.471
Source: Saskatchewan Agricultural Statistics, 1985

averages. Fall rye, flax and canola (rape) has experienced the best province-wide improvements between the ten year averages ending in 1980 and 1985 (12 to 15 percent for each).

While fall rye, flax and canola production in the Rafferty Area is 23 to 30 percent below provincial averages, fall rye in the Alameda Project Area has been very successful, being 20 percent above the provincial average. That appears to be the only "bright light" in the agricultural sector in the Study Area however, the success of that crop is more a reflection of producers' response to climate than to market trends.

.3 Rangeland and Animal Production

The only major block of rangeland in the immediate region occurs along the Souris River where the presence of large numbers of rocks and steep slopes make the land unsuitable for cultivation. Cattle are virtually the only animals raised on this land as is indicated by the numbers of livestock on census farms in 1976 in the four Rural Municipalities bordering the Souris River (Table 5). Sheep, the only other range animal raised in Saskatchewan, are present in very low numbers.

For the two census divisions in which the Project Area falls, Census of Canada data indicate strong fluctuations in the number of cattle raised in the region (Table 6). These fluctuations are due mainly to market and forage supply conditions.

Swine production in the region averaged 750 hogs per Rural Municipality in Census Divisions 1 and 2 for 1976. This was considerably higher than the average of 200 for the four Rural Municipalities in the area surrounding the proposed Rafferty Reservoir.

In 1976 the mean number of cattle per Rural Municipality for Census Division 1 was 12,200 and for Census Division 2 it was 8,500. The four lower Rural Municipalities in the immediate Rafferty Project Area averaged only 6,900 cattle, considerably below the average for the region. This difference would be due to the high percentage of area in rangeland in the Missouri Coteau and nearby valley systems to the west and the Moose Mountain uplands and its associated drainages to the east. These areas provide a greater overall percentage of the total area as rangeland for the region than the Souris River and its associated grasslands provide for the immediate Study Area.

TABLE 5

Livestock on Census Farms in Four Municipalities in the Estevan Area*, 1976.

| Municipality Name | No. | Total Cattle | Pigs | Sheep | Hens and Chickens |
|---|---|---|---|---|---|
| Estevan | 5 | 9,684 | 158 | 3 | 5,023 |
| Cambria | 6 | 5,461 | 116 | — | 3,499 |
| Cymri | 36 | 10,254 | 316 | 78 | 5,983 |
| Lomond | 37 | 8,989 | 223 | 4 | 6,544 |

* Weyburn R.M. Virtually no rangeland on Glacial Lake Regina plain. It is prime land for cereal crop production. Therefore, no included in this table.

TABLE 6

Numbers of Livestock in Census Divisions Within the Study Area.

| Census* Division | Year | Total Cattle | Cows | Heifers | Steers | Bulls | Calves | Pigs |
|---|---|---|---|---|---|---|---|---|
| | 1981 | 170,358 | 72,720 | 18,101 | 13,145 | 3,729 | 62,663 | 29,533 |
| Division 1 | 1976 | 244,242 | 92,533 | 27,777 | 28,061 | 4,192 | 71,679 | 20,165 |
| | 1971 | 194,214 | 83,366 | 21,852 | 19,657 | 3,654 | 65,685 | 57,027 |
| | 1981 | 135,198 | 61,637 | 10,880 | 6,188 | 3,150 | 53,343 | ** |
| Division 2 | 1976 | 170,808 | 73,581 | 19,387 | 15,755 | 3,601 | 58,484 | 11,595 |
| | 1971 | 149,645 | 66,132 | 16,408 | 11,113 | 3,158 | 52,834 | 38,736 |

* Census Division 1 includes Rural Municipalities 1-5, 31-35, 61-65, 91-95
Census Division 2 includes Rural Municipalities 6-10, 36-40, 66-70, 96-100
**No Data Available

Carrying capacity of the rangeland of the area can be estimated from the range condition ratings indicated in the natural vegetation section and the available literature. The Alberta range condition guide (Smoliak et al 1976) indicates the following carrying capacity estimates for areas with annual precipitation below 350 and 450 mm:

| Range Condition Rating | Recommended Stocking Rates Animal Unit Months/ha |
|---|---|
| Excellent | 1.24 |
| Good | 0.99 |
| Fair | 0.74 |
| Poor | 0.49 |

The 1984 yield results showed somewhat higher grazing capacity than the above values. Fifty percent of the sites surveyed in this study have been classified as fair range condition. Approximately 40% of the sites are in good condition and only 10% are in excellent range condition. Therefore, the grazing capacity in the development area would be largely in the 0.74-0.99 Animal Unit Months/ha range but this viewed in the context of large annual variations in soil moisture levels.

Actual stocking rates provided by PFRA (Prairie Farm Rehabilitation Administration) for the 1983 grazing season were 0.93 and 1.5 ha/AUM (Animal Unit Month) for the Lomond and the Estevan-Cambria community pastures, respectively. Individual field stocking rates varied from 0.5 to 3.8 AUM/ha. Again, it must be noted that a major flood occurred in 1982 and 1983 hence soil moisture levels were relatively good.

### .4 Types of Farms, 1981 Canada Census

The 1981 Canada Census classified farms on the basis of commodity or group of commodities which accounted for 51% or more of the potential sales of farms with sales of $2500 or more. The dominant type of farm in Saskatchewan and in Census Divisions 1 and 2 is the wheat farm - 64% of commercial farms in Saskatchewan derive the majority of revenues from wheat sales as compared to other field crops, alone or in combination with cattle. This proportion is somewhat lower in Census Division 1 (58%) but is significantly higher in Census Division 2 (78%). The overall rate for the 7 Rural Municipalities in the

Project Area is 70.6%. Viewed on a Rural Municipality basis (Table 7), the proportion of wheat farms ranges from a low of 46% in the R.M. of Moose Mountain to a high of 87% in the R.M. of Cambria.

Cattle farms are the second most important type of farm representing 12% of Saskatchewan farms and about the same (10%) in C.D.2. Census Division 1 has 20% of its farms classified as cattle farms. Dairy farms, hog farms and poultry farms represent minor types of farms in the province and in the southeast. Mixed farms of various types are also infrequent (about 1 out of 20) yet are found more frequently in Census Division 1.

.5 Improved Agriculture Lands

To a great extent, the prevalence of different types of farms reflects the characteristics of the land base. Much of the Project Area is improved agricultural land. Improved lands include area under crops, summerfallow and improved pasture; ranging from a low of 72% in the R.M. of Lomond to a high of 93% in the R.M. of Weyburn. The high percentage of unimproved land in the R.M. of Lomond (28%) reflects soil conditions unsuitable for cultivation along the Souris Valley (see Table 8).

.6 Field Crops and Yields, 1981 Canada Census

In Census Division 1, 90% of the farms reported wheat on 437,070 ha (1,080,000 acres). In Census Division 2, 95% of the farms reported wheat on 594,091 ha (1,468,000 acres). The average number of hectares of wheat per farm was 174.4 ha (431 acres) in Census Division 2 as compared to 139.6 ha (345 acres) in Census Division 1.

Other field crops are not important compared to wheat in terms of either acreage or incidence among farms. Barley is the second largest crop in Census Division 1 occupying 67,179 ha (166,000 acres) and found on 41% of the farms but is less prevalent in Census Division 2 27,924 ha (69,000 acres), 22% of farms). Tame hay is the third largest crop on an area basis occupying 46,540 ha (115,000 acres) in Census Division 1 (41% of farms) and 29,947 ha (74,000 acres) in Census Division 2 (25% of farms). Oats for grain rank fourth with 44,516 ha (110,000 acres) in Census Division 1 (46% of farms) and 20,639 ha (51,000 acres) (30% of farms) in Census Division 2.

TABLE 7

Regional Agriculture Profile
Types of Farms, 1981

| Municipality | Total Farms Typed | % Wheat Farms | % Cattle Farms | % Other Types |
|---|---|---|---|---|
| Rafferty Area: | | | | |
| Estevan No. 5 | 215 | 65% | 14% | 15% |
| Cambria No. 6 | 154 | 87% | 5% | 7% |
| Cymri No. 36 | 194 | 80% | 12% | 6% |
| Lomond No. 37 | 151 | 76% | 16% | 7% |
| Weyburn No. 67 | 256 | 79% | 6% | 12% |
| Sub-Total: | 970 | 77.4% | 10.6% | 9.4% |
| Alameda Area: | | | | |
| Moose Creek No. 33 | 180 | 61% | 18% | 19% |
| Moose Mount. No. 63 | 229 | 46% | 29% | 23% |
| Sub-Total: | 409 | 53.5% | 23.5% | 21% |
| TOTAL PROJECT AREA | 1,379 | 70.6% | 14.3% | 12.7% |
| Census Division 1 | 3374 | 58% | 20% | 20% |
| Census Division 2 | 3485 | 78% | 10% | 10% |

Source: adapted from Statistics Canada, 1981 Canada Census.

TABLE 8

Regional Agriculture Profile
Area by Type of Use in hectares (acres), 1981

| Municipality | Total Area | Improved | Unimproved | % Improved |
|---|---|---|---|---|
| Rafferty Area: | | | | |
| Estevan No. 5 | 76,799 (189,770) | 60,153 (148,639) | 16,646 (41,132) | 78% |
| Cambria No. 6 | 84,266 (208,221) | 73,845 (182,472) | 10,410 (25,723) | 88% |
| Cymri No. 36 | 88,510 (218,709) | 68,474 (169,199) | 20,036 (49,510) | 77% |
| Lomond No. 37 | 76,894 (190,004) | 55,714 (137,669) | 21,178 (52,331) | 72% |
| Weyburn No. 67 | 92,493 (228,551) | 85,670 (211,691) | 6,823 (16,859) | 93% |
| Sub-Total: | 418,962 (1,035,255) | 343,857 (849,670) | 75,093 (185,555) | 82% |
| Alameda Area: | | | | |
| Moose Creek No. 33 | 75,726 (187,119) | 61,767 (152,626) | 13,960 (34,495) | 82% |
| Moose Mount. No. 63 | 78,959 (195,108) | 61,206 (151,240) | 17,753 (43,868) | 78% |
| Sub-Total: | 154,685 (382,227) | 122,973 (303,866) | 31,713 (78,363) | 79.5% |
| TOTAL PROJECT AREA | 573,647 (1,417,482) | 466,830 (1,153,536) | 106,806 (263,918) | 81.4% |
| Census Division 1 | 1,384,700 (3,421,594) | 1,075,924 (2,658,608) | 308,781 (762,999) | 78% |
| Census Division 2 | 1,541,944 (3,810,144) | 1,224,055 (3,024,640) | 317,885 (785,493) | 79% |

Note: To convert acres to hectares, divide by 2.471
Source: adapted from Statistics Canada, 1981 Canada Census.

Overall, the Study Area is a wheat growing area with other field crops of secondary importance.

.7 Livestock Production and Sales, 1981 Canada Census

While cattle farms represent only 12% of farms classified by dominant source of income, fully 48% of farms in the Project Area reported having cattle in 1981. On an R.M. basis, as low as 35% of farms and as high as 62% of farms have some cattle. 683 farms reported 52,859 cattle in the Project Area - an average of 77 per farm (Table 9).

.8 Irrigation, 1981 Canada Census

Forty-five farms reported 792.8 ha (1,959 acres) of irrigated land in Census Divisions 1 and 2 combined. This area represented 1.4% of the total irrigated area in the province. The average area irrigated in the Study Area was 17.8 ha (44 acres) per farm compared to a provincial average of 43.7 ha (108 acres). (The census defined irrigation as the application of water to the land by artificial means such as a system of ditches, furrows, sprinklers or similar works including the purchase of custom irrigation).

Sprinkler irrigation was reported by 27 farms on a total area of 416.4 ha (1,029 acres) (average of 11.3 hectares per farm). This rate of sprinkler irrigation to total irrigation is similar to that for the province. Nine of these farms are in the Rafferty Project Area (see Table 10).

The occurrence of irrigation farming in the Study Area is only between 6 and 7 farms out of every thousand. The provincial rate is 20 farms per 1000.

The greatest concentration of irrigation is in Estevan R.M. where 8 farms totaling 263 hectares are found. Only 24.3 of these hectares are irrigated by sprinkler. The other eight farms reporting irrigation are fairly well distributed throughout the Rafferty Area. The size of operation appears to either be in the 4 to 8 hectare size or the 40 to 45 hectare size based on the data. There are no irrigated farms in the Alameda area.

## OTHER LAND USES

The existence of other exploitable resources in the Study Area has led to the creation of additional significant land uses.

TABLE 9

Regional Agriculture Profile
Incidence of Cattle on Farms, 1981

| Municipality | Farms with Cattle | % Farms with Cattle | Number of Cattle | Average per Farm |
|---|---|---|---|---|
| Rafferty Area: | | | | |
| Estevan No. 5 | 102 | 44% | 6,608 | 65 |
| Cambria No. 6 | 47 | 30% | 3,622 | 77 |
| Cymri No. 36 | 100 | 50% | 6,220 | 62 |
| Lomond No. 37 | 89 | 59% | 8,395 | 94 |
| Weyburn No. 67 | 93 | 35% | 5,832 | 63 |
| Sub-Total: | 431 | 43.6% | 30,677 | 71.1% |
| Alameda Area: | | | | |
| Moose Creek No. 33 | 107 | 58% | 8,772 | 82 |
| Moose Mount. No. 63 | 145 | 62% | 13,410 | 92 |
| Sub-Total: | 252 | 60% | 22,182 | 88% |
| PROJECT AREA | 683 | 48% | 52,859 | 77 |
| Census Division 1 | 1,964 | 56% | 170,358 | 87 |
| Census Division 2 | 1,695 | 48% | 135,198 | 80 |

Source: adapted from Statistics Canada, 1981 Canada Census.

TABLE 10

Regional Agriculture Profile
Irrigation, 1981

| Municipality | Total Area | | Sprinkler System | |
|---|---|---|---|---|
| | Hectares (acres) | # Farms | Hectares (acres) | # Farms |
| Rafferty Area: | | | | |
| Estevan No. 5 | 263 (650) | 8 | 24 (60) | 5 |
| Cambria No. 6 | - | - | - | - |
| Cymri No. 36 | 44 (109) | 2 | - | - |
| Lomond No. 37 | 47 (115) | 2 | 47 (115) | 2 |
| Weyburn No. 67 | 8 (21) | 4 | 2 (5) | 2 |
| Sub-Total: | 362 (895) | 16 | 73 (180) | 9 |
| Alameda Area: | | | | |
| Moose Creek No. 33 | - | - | - | - |
| Moose Mount. No. 63 | - | - | - | - |
| Sub-Total: | - | - | - | - |
| PROJECT AREA | 362 (895) | 16 | 73 (180) | 9 |
| Census Division 1 | 438 (1,083) | 21 | 179 (441) | 15 |
| Census Division 2 | 355 (876) | 24 | 238 (588) | 12 |

Note: 1 hectare = 2.471 acres
Source: adapted from Statistics Canada, 1981 Canada Census.

.1 Oil and Gas

Oil and gas pools in the Study Area cover significant tracts of land. Figure 3 identifies the location of oil and gas pools in the Study Area. The two principal areas in terms of overall size are located in the Midale and Lampman areas. Other smaller pools are located primarily in the eastern part of the Study Area although some are found in the southwestern portions.

Estevan, while not having any adjacent oil and gas lands is located in the center of oil activity and has become the dominant base for most oil-related activity in the Study Area.

Oil activity tends to share the use of land with agriculture, as opposed to displacement, with two wells per quarter section being a common pattern. Power lines and maintenance access roads are the most obvious visible features associated with this activity. Occasional storage tanks and batteries are also evident. Texas gates are used extensively in the pasture areas.

.2 Coal Mining

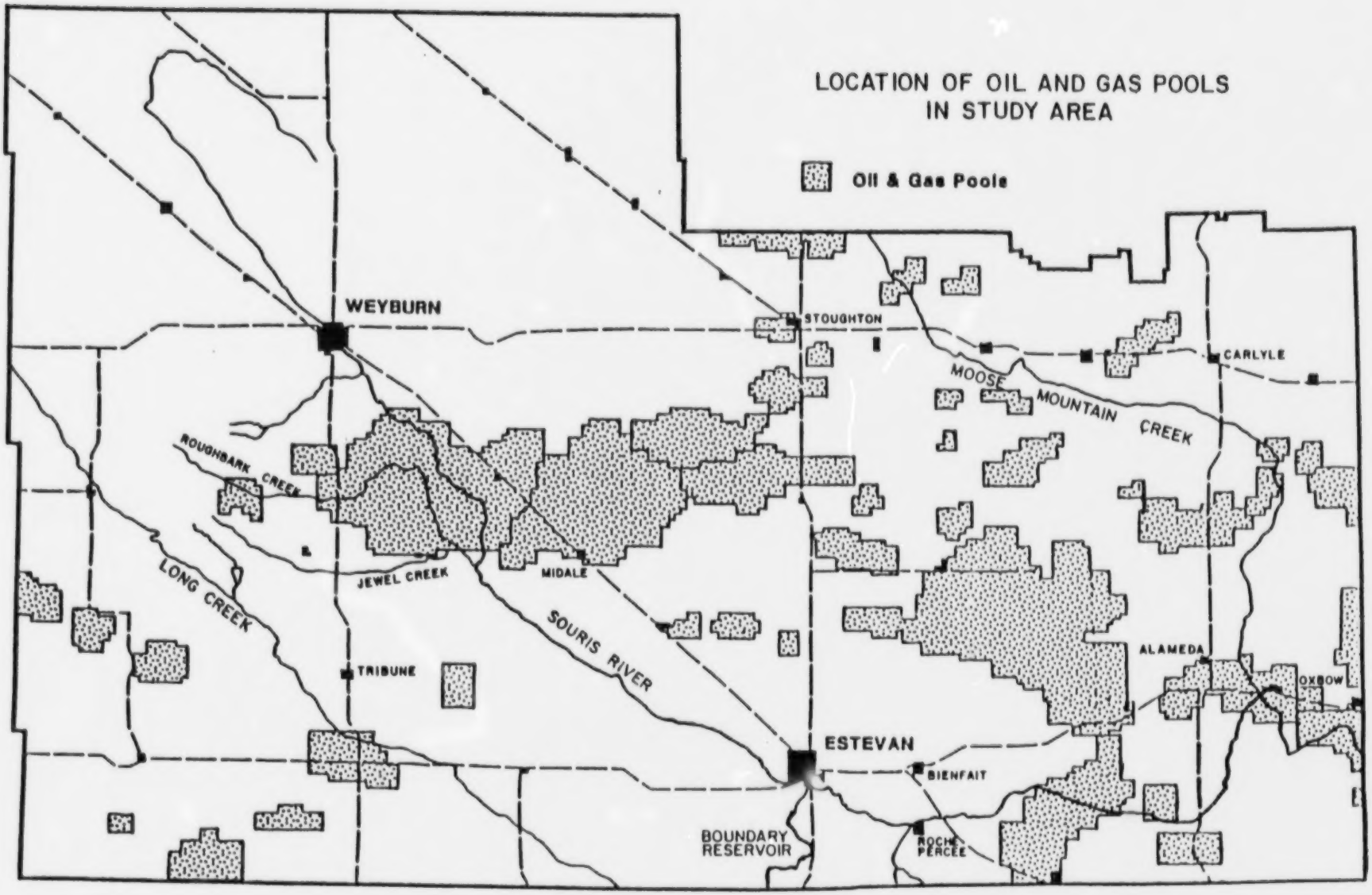
Coal mining, while a significant and visible use of the land, is not as widespread as oil and gas. Located in a belt roughly from southwest of Estevan to south of Bienfait, the coal lands have been in use for many years. In a regional context they do not represent extensive land use. In the Estevan-Bienfait area however, coal mining is a more dominant factor. Most of the coal mining areas will eventually be reclaimed in the future, as the older spoil piles will be re-mined to remove deeper coal seams.

.3 Utility Lands

The use of coal for electrical generation at the Estevan and Boundary Dam stations represent intensive yet localized uses of land. The creation of the Boundary Dam reservoir is a related land use. The Estevan Brick operations are another localized land use.

The most significant utility corridors in the Study Area relate to pipelines for the collection of oil and electrical transmission lines for the transmission of electricity to the load centers. There are several transmission lines radiating from the Estevan area. There are two paralleling the Souris River - one on the north, the other on the south. In addition,

FIGURE 3


LOCATION OF OIL AND GAS POOLS
IN STUDY AREA
Oil & Gas Pools
WEYBURN
STOUGHTON
CARLYLE
MOOSE MOUNTAIN CREEK
ROUGHBARK CREEK
JEWEL CREEK
MIDALE
LONG CREEK
SOURIS RIVER
TRIBUNE
ALAMEDA
OXBOW
ESTEVAN
BIENFAIT
BOUNDARY RESERVOIR
ROCHE PERCEE

there are two transmission lines going north, another directed to the north-northeast and yet another in a northeast direction. The Estevan and Boundary Dam generating stations represent an integral part of the Saskatchewan electrical grid system.

The overall pattern for utility lands sees the use of some tracts of land in the Estevan area with linear transmission lines to the northwest, north and northeast.

.4 Recreation

Lands designated for recreational uses do not currently comprise a large land use category. Regional Parks like Dr. Mainprize at the Souris River south of Midale, Oungre Memorial Regional Park near Oungre, Nickle Lake southeast of Weyburn and Woodlawn near Estevan are the most significant recreation lands in the central part of the Study Area. Bow Valley Regional Park near Oxbow is significant in the eastern part of the Study Area.

The Moose Mountain Provincial Park and the White Bear Lake Resort at Carlyle Lake represent major recreation tracts to the northeast. Provincial campsites and day use areas are also found in the Study Area. Provincial Recreation Sites include the Boundary Dam Recreation Site south of Estevan, the Roche Percee Recreation Site (camping) southeast of Estevan and the Souris River Recreation Site (picnicking) located south of Oxbow.

## SPECIALLY DESIGNATED AREAS

Within the province of Saskatchewan, various parcels of land have received special designations for one purpose or another. Examples of these are game preserves, wildlife management units, critical wildlife habitat protected lands and wildlife refuges, all of which have been established for reasons relating to wildlife or problems associated with wildlife. Protected areas, historic sites and provincial parks are other examples of specially designated areas.

A game preserve immediately south of Estevan in the river valley does not lie within any of the areas proposed for reservoir development although the downstream river channel improvements between the Rafferty Dam site and the Shand power plant site passes through it. The two PFRA pastures in the Project Area, Lomond #1 and Estevan-Cambria, have been designated as wildlife

management units. These were originally set up for managing the pastures for livestock protection during hunting seasons. They have also been used for game management in the past however. Other specially designated areas are the two regional parks of Woodlawn and Dr. Mainprize. Woodlawn Regional Park lies within the Estevan game preserve mentioned previously. Dr. Mainprize Regional Park lies within the Souris River valley within the proposed Rafferty reservoir. Fifteen quarter sections in the Project Area were desigrated under the Critical Wildlife Habitat Protection Act. Approximately half of this habitat land will be affected by the project. (These lands are discussed in detail elsewhere in this Statement.)

There are no areas currently designated as Provincial Parks, National Parks, or historic sites within or near the Project Area. One area identified as a candidate IBP (International Biological Program) natural area is located to the east of the Rafferty Project Area along the Souris River at Pinto, approximately 20 km downstream from Estevan.

## RAFFERTY PROJECT AREA

### .1 Land Tenure

The proposed development sites are controlled by both federal and provincial governments, as well as by private land owners. In total, portions of approximately 251 quarter-sections of land will be affected by the dam and spillway construction or through creation of the reservoir to Full Supply Level. Of this total, 37 quarter-sections lie within federally owned PFRA community pastures (Lomond No. 1 and Estevan-Cambria). These lands currently support mainly native vegetation (unimproved pasture) and are used for cattle grazing. An additional 125 quarter-sections to be affected are owned by the provincial government. These include lands within the Midale SDA community pasture and leased crown lands. Many of the leased lands are hay leases along the alluvial floodplains in the middle and lower sections of the reservoir.

Approximately 89 quarter-sections of private deeded land will be affected by the reservoir. A small proportion of this area is cultivated land located in the Souris River Valley between the Midale pasture and #705. Fifty-seven quarter- sections of private land to be affected occur below Dead Lake. This land is largely used for production of perennial forage crops. The remainder

of the private land in this region is native pasture occurring mainly on valley slopes.

.2 Soil Capabilities

Soil capabilities for agriculture were mapped for Saskatchewan by the Canada Land Inventory (CLI) and the results for the Estevan area (Weyburn map sheet) were published in 1966. The soils were divided into seven capability classes under this system with class 1 being the best and class 7 being the worst. Class 1 soils have no significant limitations in use for field crops. In the Weyburn map sheet no land falls into class 1 capability. Similarly no land falls into class 7 lands which are described as having no capability for arable agriculture or permanent pasture. Soil capability for the map sheet therefore ranges from class 2 (moderate limitations for field crops) to class 6 (capable of producing native perennial forage crops only---improvements not feasible), with soils in the immediate Estevan area ranging from class 3 to class 6.

Within the proposed reservoir area from a point 6 km downstream of the Dead Lake dam to the upper end of the reservoir the river valley falls into class 5 lands. These are lands with very severe limitations that restrict their capability to produce perennial forage crops and where improvement practices are feasible. The main limitations are the rough topography and stoniness.

From the proposed dam site to a point 6 km downstream of Dead Lake the valley is classified as being class 4 and class 5 lands. Class 4 lands include soils that have severe limitations that restrict the range of crops or require special conservation practices, or both. The valley bottom is classified as class 4 with limitations due to inundation as a result of spring flooding by the Souris River and because of poor internal drainage. The valley walls in this region are class 5 lands due to their steep topography and stoniness.

The proposed flood diversion channel connecting the Rafferty Reservoir with Boundary Reservoir would run through class 5 land currently in native pasture. Stoniness of the land is the main reason for the poor capability rating given to this area.

.3 Agricultural Land Use

Landforms and soil characteristics are the main factors determining the type of agricultural land use possible in the area. Deposits of glacial till (moraine) form the lands immediately bordering the Souris River. The Souris River Valley was formed as a glacial meltwater channel following the deposition of this moraine. Before the valley was cut, the uplands adjacent to the valley were also scoured by this meltwater. This resulted in removal of surface soil and of some of the fine materials in the remaining surface soils. The high rock density on the surface in much of this area is the lag deposit resulting from this action. The low percentage of fine materials in these soils results in low water holding capacity. These two factors have limited agricultural use of these eroded uplands bordering the Souris River to grazing by cattle and wildlife.

The Souris River valley itself has steep rocky slopes suitable only for cattle grazing. The floodplain is more suitable to other agricultural endeavors. However, the characteristics of the floodplains change between Weyburn and Estevan. In the upper reaches much of the floodplain is relatively high. This lends itself to cultivation where stoniness in the valley bottom is not a problem. Below Dead Lake the floodplain is low and poorly drained in some areas. It is subject to flooding and protracted periods of inundation. This limits agricultural capability in these areas to irregular production of perennial forage crops.

The eroded moraine along the valley varies in width from 1 km to 4 or 5 km. Bordering this is a glacial till land type of low relief with occasional pockets of fluvial deposits. These areas are generally suitable for cultivation of cereal grains although salinity is relatively high through much of the area.

The 9 km proposed diversion channel route between Boundary Reservoir and Rafferty Reservoir crosses native grassland along most of its course. Approximately 2 km of the channel will be through coal strip mined lands.

Land use within the area to be affected by the reservoir development is the most diverse of all areas to be affected. The proposed reservoir area includes portions of the three community pastures located in this region. All three pastures are used for grazing of cattle. A large proportion of the

valley bottom within Midale SDA (Saskatchewan Department of Agriculture) pasture is used for hay production and is fenced to exclude all cattle.

Three large scale maps (located within the back cover of this volume) illustrate the settlement pattern (Figure 3a Rural Development Inventory), Land Use (Figure 3b) and Land Ownership (Figure 3c) in the Rafferty Project Area.

Within the reservoir area, the 2,047 ha (5,058 acres) of land supporting grass and shrub vegetation is used for grazing and makes up the greatest proportion of the area. Streamside vegetation including woodlands as well as marshland and oxbow meadows comprise another 630 ha (1,557 acres). Some of this area is also grazed by cattle but areas bordering haylands and cultivated river bottom lands are ungrazed and provide good wildlife habitat. 518 ha (1,280 acres) are used in crop production while 1,160 ha (2,865 acres) are currently being used as hayland. Another 488 ha (1,206 acres) of land within the reservoir area is not being utilized for agriculture. These areas are currently open water areas, recreational areas, roads, farmyards, oil well facilities and disturbance sites such as gravel pits. Ecological land units and their major land uses within the proposed reservoir up to the Initial Operating Level are summarized in Table 11.

The three primary uses of the area to be affected by the reservoir from an agricultural point of view are haylands, cereal crop production and cattle grazing, primarily within the three community pastures.

.4 Haylands

According to aerial photo-interpretation and mapping, 1,160 ha (2,866 acres) of haylands will be inundated by the Rafferty Reservoir. The majority of these haylands are in the lower reaches of the valley, between the Midale Dam and the proposed Rafferty dam site. Two other significant blocks of hayland occur in the upper reaches of the reservoir, one between Dr. Mainprize Regional Park and the Roughbark-Souris confluence, and the second within three kilometres north and south of #705 in the Souris Valley. There are no haylands in the Dead Lake channel within the Midale Community Pasture or within the Roughbark and Jewel Creek valleys in the Lomond#1 PFRA Community Pasture.

TABLE 11

Major Land Uses of Areas Within the Proposed Rafferty Reservoir (549.5m)

| Area (ha) | Ecological Land Unit or Cultural Type | Major Land Uses |
|---|---|---|
| 201 | Riparian graminoid | |
| 109 | Riparian tree-shrub | Cattle grazing and wildlife lands |
| 225 | Typha marsh | |
| 95 | Oxbow graminoid | |
| 448 | Alluvial grass/shrub | |
| 1,221 | Valley slope grass | |
| 357 | Valley slope shrub | Cattle grazing, minor wildlife use |
| 12 | Valley slope aspen | |
| 9 | Till plain grass/shrub | |
| 1,160 | Alluvial haylands | Hay production |
| 518 | Alluvial annual crops | Cereal crop production |
| 368 | Open water - nonvegetated | |
| 38 | Open water - submerged aquatics | Recreational fishing, waterfowl use |
| 25 | Alluvial recreation | Golf course, picnic site, Bible camp |
| 57 | Disturbance areas and farmyard areas | Gravel extraction, farmyard |

Source: Tamarack Environmental Services 1986

In 1986, Saskatchewan Agriculture leased six irrigated hay plots, totaling 57.4 ha (141.8 acres) to five individual farmers. These six hay plots averaged 9.6 ha (23.6 acres) in size.

Saskatchewan Agriculture also leased 20 non-irrigated hay plots totaling 259.8 ha (642 acres) to 19 other individuals. These parcels averaged 13 ha (32.1 acres) in size, with some as large as 25 ha and others as small as 4.5 ha. Three other small hay plots totaling 17.4 ha (43 acres) were unallocated in 1986.

In addition to the provincial hay leases primarily within the Souris Valley floodplain in the Midale Pasture and southwest of Dead Lake, there are a number of private hayfields. As shown on Figure 4 these are concentrated in the reach of the valley immediately upstream of the dam site (11 landowners) and north of the Midale Pasture (3 landowners).

Hay production from the non-irrigated lands varies from year to year dependent upon spring floods and soil moisture conditions, summer precipitation and temperatures. Based on an average productivity of 1.85 tonnes per hectare (0.75 tonnes per acre), 1,100 ha of non-irrigated haylands would have produced an average of 2,035 tonnes annually. 60 ha of irrigated hay plots would have produced an additional 300 tonnes assuming an average annual productivity of 5 tonnes per hectare. In total, approximately 2,335 tonnes of annual hay production will be lost to the Rafferty Reservoir. The Authority recognizes the importance of this lost hay production to local landowners and lessees but considers this loss to be a realistic trade-off in favour of anticipated increased agricultural productivity and diversification downstream from the Rafferty Dam. Approximately 3,238 ha (8,000 acres) of downstream lands within the Souris Valley are Class 2 and Class 3 potentially irrigatable lands.

The Authority will be compensating landowners and crown land lessees according to the land acquisition policy. Some farmers may find it necessary to establish perennial hay crops on some of their nearby upland holdings.

### .5 Cereal Crop Production

According to aerial interpretation and mapping of the lands to be inundated by the Rafferty project, 518 ha (1,280 acres) of cropland will be lost. This represents approximately 10.7 percent of the total area to be inundated. Figure 4 illustrates the location of these crop lands.

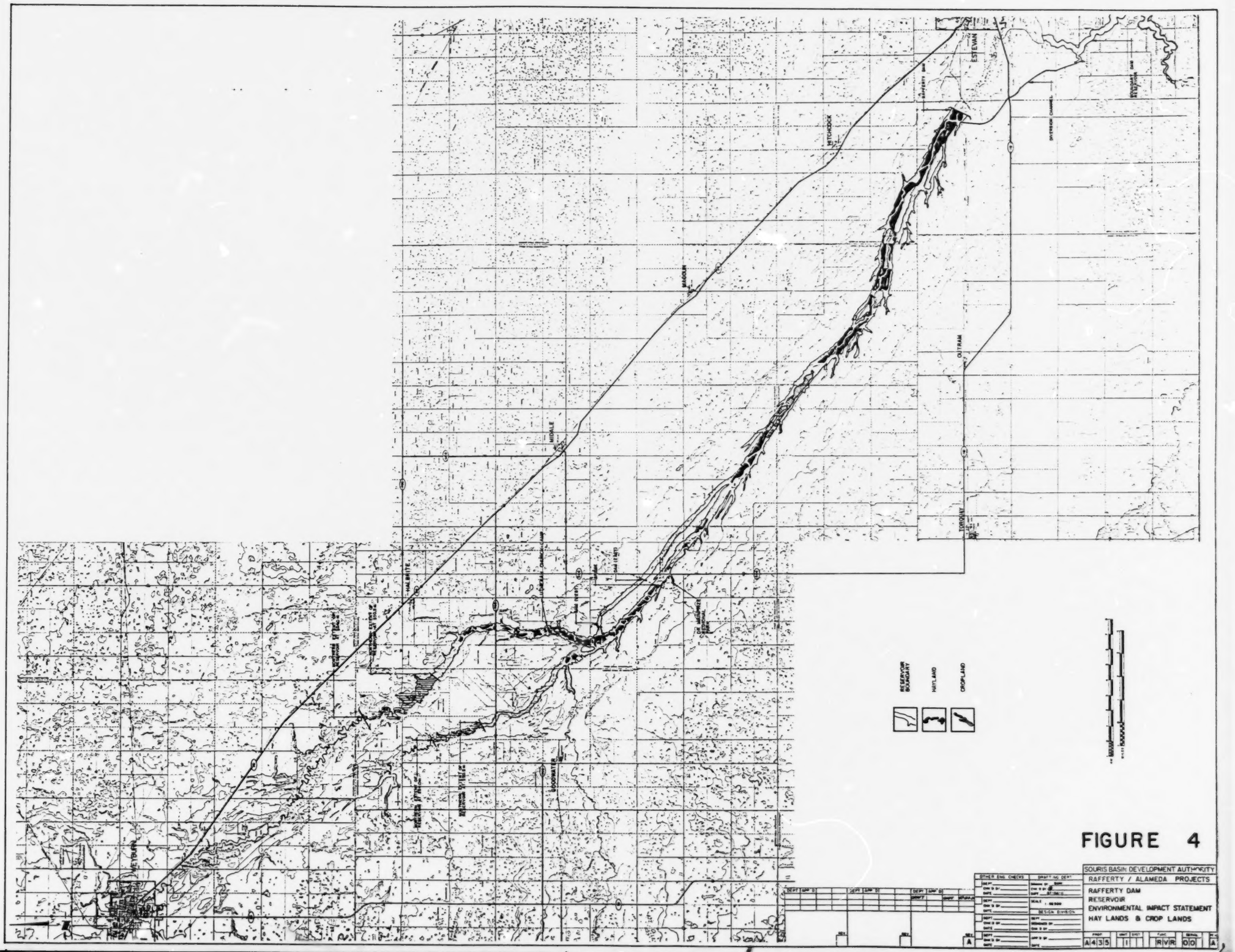



FIGURE 4

SOURIS BASIN DEVELOPMENT AUTHORITY
RAFFERTY / ALAMEDA PROJECTS
RAFFERTY DAM
RESERVOIR
ENVIRONMENTAL IMPACT STATEMENT
HAY LANDS & CROP LANDS

Based on crop insurance information of the most productive land adjacent to the Souris Valley, the long-term yields for wheat are 26 bushels per acre on summerfallow and 18 bushels per acre on stubble. Barley yields are 40.4 bushels per acre on summerfallow and 28.3 bushels per acre on stubble. Most adjacent land is classed lower and include wheat yields of 20 bushels per acre on summerfallow and 14 bushels per acre on stubble. Barley yields of 30.4 bushels/acre for summerfallow and 21.3 bushels/acre on stubble are reported. No yield classifications are available for the Souris River Valley (Saskatchewan Agriculture, Pers. Comm., 1986).

Under continuous cropping, using the high yields and the 518 ha (1,280 acres) involved, 23,040 bushels of wheat production or 36,224 bushels of barley production would be lost. With a 50-50 cropping program the bushels lost annually would be 16,640 bushels of wheat or 25,856 bushels of barley.

## COMMUNITY PASTURES IN RAFFERTY PROJECT AREA

### 1. INTRODUCTION

In order to evaluate the long-term impacts of the Rafferty Reservoir on community pastures, one must understand terms such as 'carrying capacities' and 'grazing rates' which are used to describe the pastures' productivity and usefulness to patrons. While there will be a direct loss of pasture land to the project, the actual impacts can be partially ameliorated through changes in pasture management such as cross fencing, brush control, distribution of salt licks and watering sources and, to a lesser extent, fertilization and irrigation. In some locations, there may be opportunities to remove surface stones and break and seed additional land.

#### .1 Carrying Capacities and Grazing Rates

The most common term used to describe carrying capacity of a pasture is Acres/Animal Unit/Month (AUM). The term refers to the long term rated capacity of the land to support cattle grazing. The carrying capacity of a parcel of land, determined by experience from grazing tests or by estimating forage production, takes into account necessary carry-over of grass left on the ground

at the end of the grazing season. This carry-over grass is required to manufacture food reserves to ensure continued vigor and productivity.

This term specifically defines the area and time involved. One animal-unit-month, or cow-month, is the grass needed to support a 1,000 pound cow, with or without a sucking calf, for one month. A mature 1,000 pound cow requires 850 to 1,000 pounds of feed per month. It should perhaps be noted that with new larger breeds of cattle and earlier calving, the forage requirements of a cow with calf are greater than in the past. A spring calf may be 300 to 400 pounds when it arrives and the larger cows may greatly exceed 1,000 pounds. Combined, they may require 1,500 pounds of feed per month. In other words, current 'carrying capacities' may be over-rated. For purposes of this discussion, this factor has not been considered.

A grazing unit with a carrying capacity of 50 cow-months should, on the average, support 10 cows for five months, 50 cows for one month or any other combination that adds up to 50 cow-months.

A figure of 2 acres/AUM means a mature cow would require 2 acres of grazing space per month or 10 acres for a grazing period of five months.

From discussions with the PFRA pastures supervisor, the carrying capacity of pastures in the Rafferty Project area is considered to be 2 to 3 acres/AUM. The requirements of a five month grazing season, say June 1 to October 31, would therefore be 10 to 15 acres per cow (with or without calf).

The long-term carrying capacity is different than the grazing or stocking rate which is the number of stock which can actually be grazed in any one season. In periods of drought, the stocking rate will be lower than the carrying capacity.

During the recent droughts, for example, PFRA was trying to maintain a stocking rate of 4.5 acres/AUM in the Lomond #1 pasture.

The carrying capacities of the three pastures in the Rafferty area have been calculated as follows:

Estevan-Cambria (PFRA) $\frac{6586 \text{ acres}}{525 \text{ cows}}$ = 12.5 acres/animal unit/5 month season

or 2.5 acres/AUM

Lomond #1 (PFRA) $\frac{23,389 \text{ acres}}{2,000 \text{ cows}}$ = 11.7 acres/animal unit/5 month season

or 2.34 acres/AUM

Midale (Cymri) SDA: 15,800 acres = 13.7 acres/animal unit/5 month season
1,150 cows

or 2.74 acres/AUM

The carrying capacities noted for the three pastures are currently much higher than the actual stocking rates, as indicated below:

| Pasture | Carrying Capacity | Stocking Rate | % Reduction |
|---|---|---|---|
| Estevan-Cambria | 525 | 445 | 15% |
| Lomond #1 | 2,000 | 1,020 | 49% |
| Midale SDA | 1,150 | 977 | 15% |
| TOTAL NUMBER COWS | 3,675 | 2,442 | 33.5% |

While the calculated carrying capacity of the three pastures was 3,675 cows (with or without calves), the current extended drought has reduced the acceptable stocking rates to 2,442 cows, a drop of 1,233 head or 33.5 percent. This reduction in stocking rates is partial and temporary, unlike the permanent loss of land to the Rafferty Project. Pasture patrons are, by the nature of the allocation system, smaller producers who rely on the community pasture to extend their land base to form a viable economic unit. These patrons, while currently affected by the reduced grazing rates associated with the drought, would be more seriously affected by a permanent loss of pasture grazing capacity.

On a per quarter-section basis, the rates of 2.5 acres/AUM for Estevan-Cambria, 2.34 acres/AUM for Lomond #1 and 2.74 acres/AUM for Midale translate into carrying capacities of 12.8, 13.7 and 11.7 animals per quarter-section respectively for a five month season. With the stocking rate lowered to 4.5 acres/AUM these pastures would only be able to accommodate 293 (Estevan-Cambria), 1,040 (Lomond #1) and 702 (Midale) for a total of 2,035 cattle. Again, on a per quarter section basis, a stocking rate of 4.5 acres/AUM is equal to 22.5 acres per animal per season (5 months). This is only 7.1 animals per quarter section of grazing land.

Note that if a grazing season is extended to say six months, from mid May to mid November, the stocking rates and capacities must be reduced accordingly. It is necessary to adhere to careful range management to ensure that long term

carrying capacities are not jeopardized. Good management normally involves restricting access to the pastures until about mid June, grazing only half of the available forage, and moving cattle around (cross fencing, salt-licks, water sources distribution) to ensure uniform grazing of the pasture. Brush control, fertilization and irrigation may also be used to increase short term forage production in some areas.

## 2. PATRONS SERVED BY RAFFERTY AREA PASTURES

Figure 5 indicates the location of the three community pastures in the Rafferty Project Area, the home locations of all patrons and the number of cattle brought to the respective pastures in 1986.

The proposed reservoir will have significant impact upon at least two of these, the smallest, Estevan-Cambria PFRA Pasture and the Midale SDA Pasture. Depending upon the home location of the patrons of these pastures, and their methods of operation, the reservoir will have direct or indirect impacts on a number of farms.

### 2.1 Estevan-Cambria Community Pasture

This PFRA community pasture is located south of the Souris River three to seven miles west of the proposed Rafferty Dam. It straddles the boundary between the Rural Municipalities of Estevan #5 and Cambria 6. It was established in 1937 and contains 2,665 ha (6,586 acres) of land, approximately 41 quarter sections (Figure 6).

In 1986, 446 cattle were accommodated, owned by sixteen pasture patrons. Eight patrons delivered 215 cattle from farms all within 10 to 20 km north of the Souris River; 231 cattle, were delivered by the other eight patrons from south and west of the pasture, of these 231 cattle, 47 came from two patrons within 10 km, 128 came from four patrons between 10 and 20 km and 56 were transported from over 75 kms west. (These two patrons have used this pasture for at least five years, having to travel considerable distances to find adequate pastures for cattle during the droughts of the early 1980's.)

With the pasture headquarters now on the western side of the pasture, the main access route is the Macoun-Outram road and bridge crossing approximately 13 km south of Macoun. This road and crossing has been especially important to

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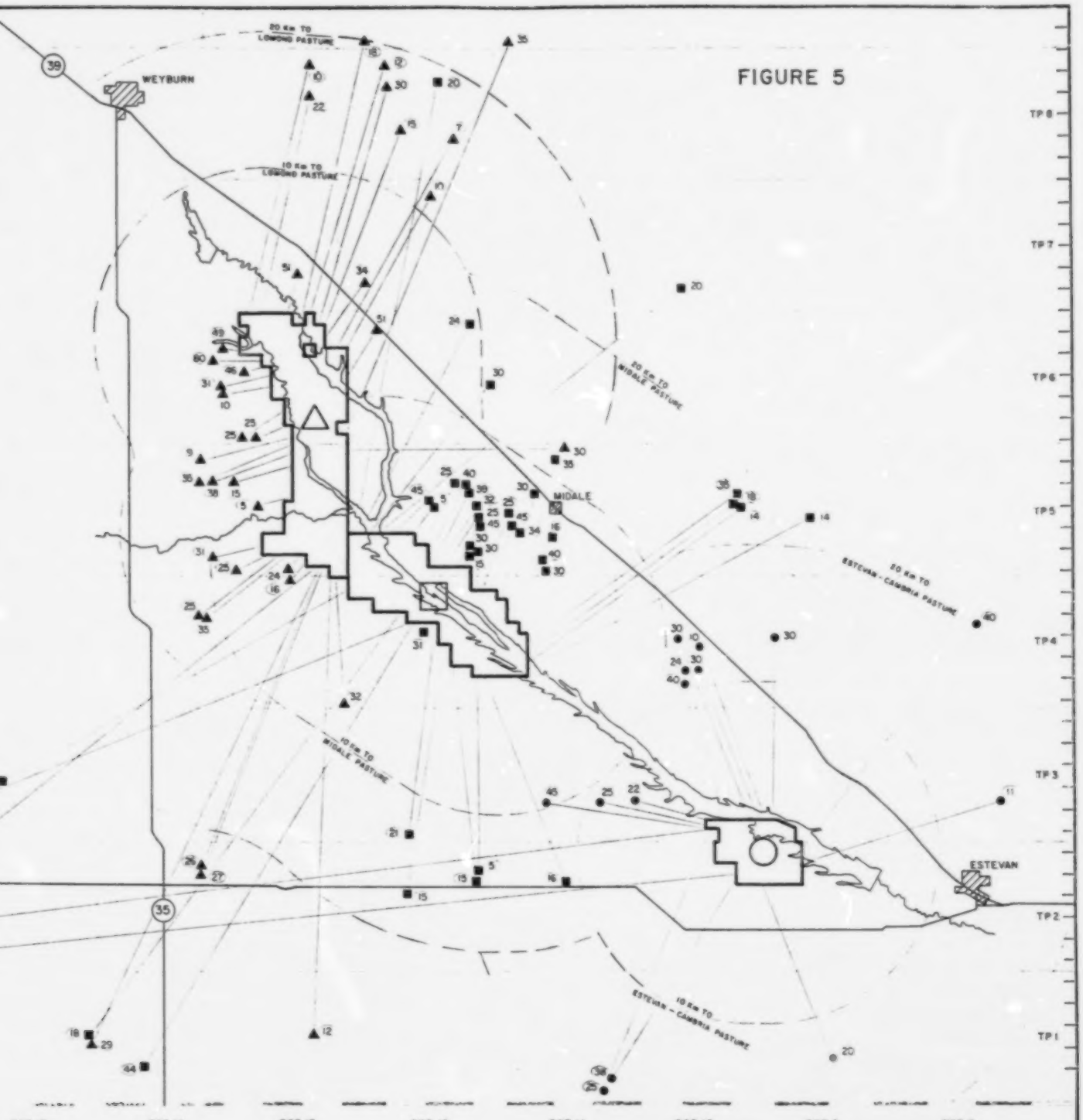
# FIGURE 5




SOURIS BASIN DEVELOPMENT AUTHORITY

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RAFFERTY / ALAMEDA PROJECTS

RAFFERTY DAM
RESERVOIR
ENVIRONMENTAL IMPACT STATEMENT
COMMUNITY PASTURES

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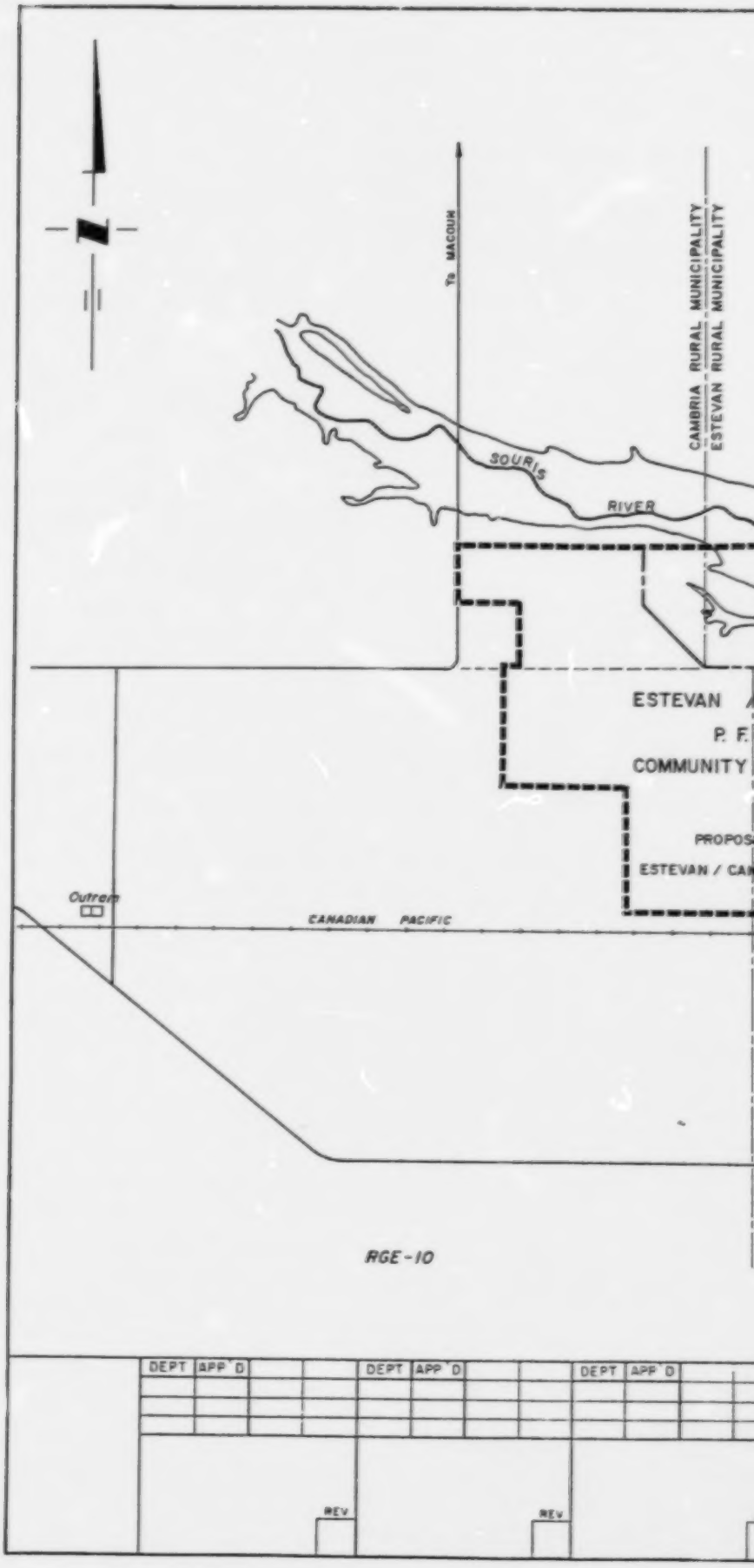
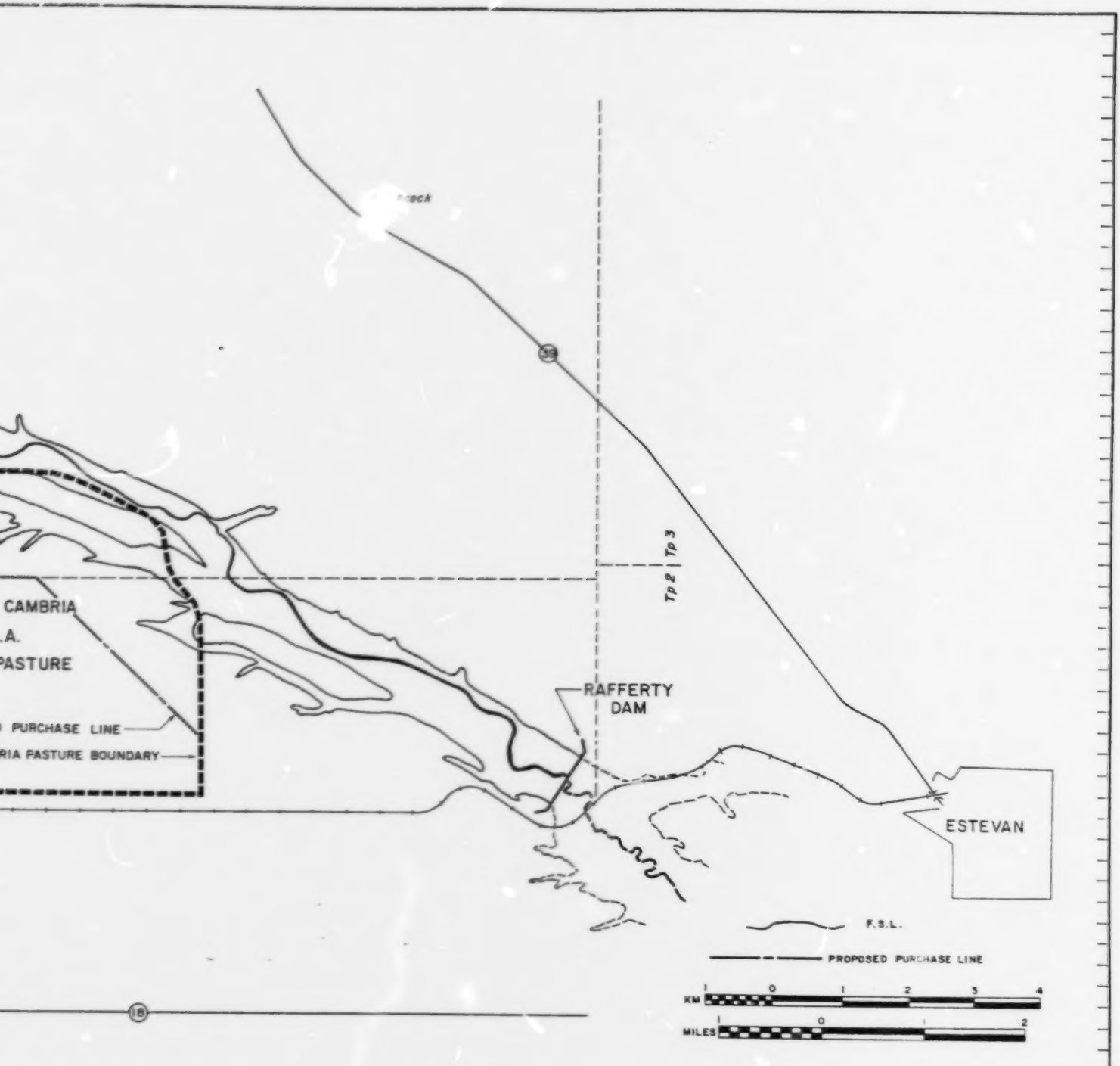

To MACOUN
CAMBRIA RURAL MUNICIPALITY
ESTEVAN RURAL MUNICIPALITY
SOURIS
RIVER
ESTEVAN
P. F.
COMMUNITY
PROPOS
ESTEVAN / CA
Outram
CANADIAN PACIFIC
RGE-10
DEPT
APP'D
REV




RGE - 9

FIGURE 6

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SOURIS BASIN DEVELOPMENT AUTHORITY

RAFFERTY / ALAMEDA PROJECTS

RAFFERTY DAM
RESERVOIR
ENVIRONMENTAL IMPACT STATEMENT
ESTEVAN/CAMBRIA P.F.R.A.
COMMUNITY PASTURE

| PROP | UNIT | SYST | FUNC | SERIAL | REV |
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those patrons living southwest of Macoun who 'trailed' (herded) their cattle to and from the pasture. With the creation of the Rafferty Reservoir, the Macoun-Outram crossing will be eliminated, requiring these patrons to transport their cattle to the pasture by truck. To accommodate these and other patrons who will continue to truck their cattle from greater distances, it is anticipated that the pasture headquarters and corrals will be relocated to the eastern side of the pasture.

The sixteen patrons served in 1986 is characteristic for this PFRA pasture when range conditions are poorer than normal due to the dry weather conditions over the past few years.

Up to twenty patrons have been served in more humid years when range conditions have permitted stocking rates to approach or exceed the carrying capacity of 525 cows. Most of the sixteen current patrons have utilized the pasture for many years. Three farmers who applied for 72 head were unable to be served due to the lower stocking rate in 1986. Three other patrons were only allowed to bring 69 of the 90 applied for. If all cattle could have been accommodated, as requested in 1986, there would have been 71 cows in the dry pasture (non breeding) and 468 breeding cows. This request for accommodating 539 cows exceeded the pasture's carrying capacity of 525.

Impact:

The major impact on the Estevan-Cambria pasture will be the direct loss of land to the reservoir area. A large island will be created northwest of McDonald Lake and will be inaccessible for pasture use.

In addition, considerable amounts of pasture land will be flood prone at elevations up to 554 m. Although not directly flooded at the Full Supply Level of 550.5 m, much of this land will become long peninsula between "fingers" of bays extending westward from the main reservoir channel. These areas will be difficult and costly to fence and manage as pasture; allocation to wildlife mitigation and park land can be considered more appropriate uses for these areas.

A total of 850 ha (2,100 acres) will likely be lost to the community pasture, approximately 32 percent of its area (Figure 6). Not all of this land is currently used for grazing as it includes the western half of McDonald Lake and some other wetlands. Without alternate replacement lands this loss of

carrying capacity, (nearly 170 cows) would be severe for the Estevan-Cambria patrons.

Loss of carrying capacity would lead to reduced grazing privileges with each patron facing reductions of ten or eleven cows if losses were divided evenly. With a number of patrons north of the reservoir being unable to herd or trail their cattle to pasture, they may choose to forego their grazing privileges. For those patrons who truck cattle from considerable distances to the west, there may be opportunities to mitigate losses by acquiring or improving other community pasture lands closer to their home locations. With the demand for pasture already exceeding the current carrying capacity, the most realistic alternative is for the Souris Basin Development Authority to acquire alternative pasture lands to compensate for losses. A public access road across the Rafferty Dam, with connecting roads north to Highway 39 and south to Highway 18, will permit direct truck access to the pasture. Relocation of the dry pasture (for non-breeding cows) and relocation of the corrals will also be necessary.

As the Rafferty Reservoir will be fenced to keep the cattle out of the reservoir area, some additional dugouts or watering dams and cross-fencing will also be required.

As this pasture will be the first to be affected by initial filling of the reservoir, the Authority will initiate negotiations for alternative lands immediately upon approval of the project. PFRA will be consulted prior to any land acquisition to ensure it is a comparable exchange in terms of carrying capacity and management responsibilities. Fencing of new boundaries, cross-fencing, dugout construction and relocation of corrals would be completed prior to the 1989 pasture year.

Mitigation Costs:

| | |
|---|---|
| - Acquisition of 12 quarters of adjacent land @ $40,000 per quarter | $480,000 |
| - Fencing & dugouts, corral relocation | 60,000 |
| | $540,000 |

2.2 Midale (Cymri) Community Pasture

The Midale Community Pasture, administered by Saskatchewan Agriculture, was established in 1952. The total area within the boundaries of the pasture

is 7,123 ha (17,600 acres), or 110 quarters including the land occupied by the Midale Dam, Dead Lake, wetlands, Dr. Mainprize Regional Park, leased haylands, roads, oilwells and gravel pits. Approximately 500 ha (1,236 acres) of valley bottom is fenced out of the pasture between Mainprize Park and the north end of the pasture, and an additional 137 ha (339 acres) is included in Dead Lake and the various wetlands.

Saskatchewan Agriculture information indicates that the actual pasture contains 6,394 ha (15,800 acres), including some of the open water, wetlands, oil well sites, access roads and so on. The carrying capacity of the pasture has been established at 1,150 cows, with or without calves. Traditionally, 65 percent of the cattle are grazed south of the Souris River.

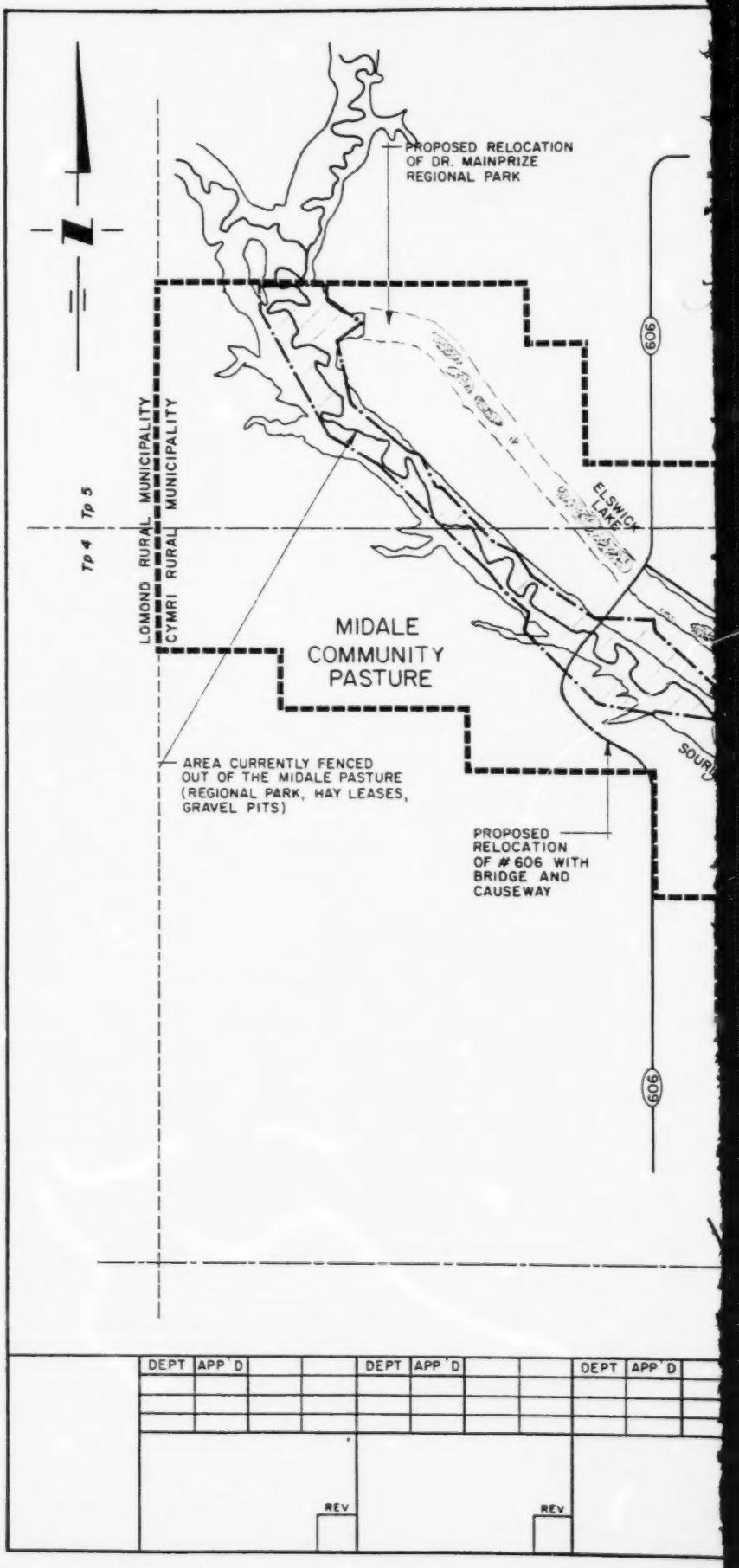
As shown in Figure 7 most of the valley floor between the Midale dam and Mainprize Park cannot be used for grazing during wet periods or following floods. The area north of the Souris Valley and west of Primary Grid #606 is used for the non-breeding cows (dry pasture).

The stocking rates in the 1980's have been below the carrying capacity, as in the PFRA pastures, due to the drought conditions and poorer range conditions. The total number of cattle in the pasture has declined from approximately 1,100 in 1981 to 977 in 1986 (833 breeding cows with calves plus 144 cows in the dry pasture).

The number of patrons with grazing privileges at the pasture was thirty-seven in 1986, also down from the forty-two to forty-five a few years ago. Of the 977 cattle delivered in 1986, 215 (22%) were delivered by ten patrons south and west of the pasture. Of these only one patron trailed his 31 head in from his farm just south of the pasture. Five patrons brought 72 cattle from 10 to 20 km, and four patrons trucked their cattle (112 head) from beyond 20 km. (One of these trucked 25 cows nearly 100 km from south of Gladmar.)

The majority of cattle (60%) and patrons originate within 10 km immediately north of the pasture where the land is best suited to mixed farming. Almost all of these cattle are trailed to the pasture rather than trucked.

78% of the cattle and 73% of the patrons originate north and northeast of the pasture. One patron brought 20 head from more than 30 km to the north, two patrons brought 34 head more than 20 km and five patrons brought 121 head from 10 to 20 km. The remaining nineteen patrons, more than half, delivered their


PROPOSED RELOCATION
OF DR. MAINPRIZE
REGIONAL PARK
606
ELSWICK
LAKE
LOMOND RURAL MUNICIPALITY
CYMRI RURAL MUNICIPALITY
Tp 5
Tp 4
MIDALE
COMMUNITY
PASTURE
AREA CURRENTLY FENCED
OUT OF THE MIDALE PASTURE
(REGIONAL PARK, HAY LEASES,
GRAVEL PITS)
PROPOSED
RELOCATION
OF #606 WITH
BRIDGE AND
CAUSEWAY
606
DEPT
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DEPT
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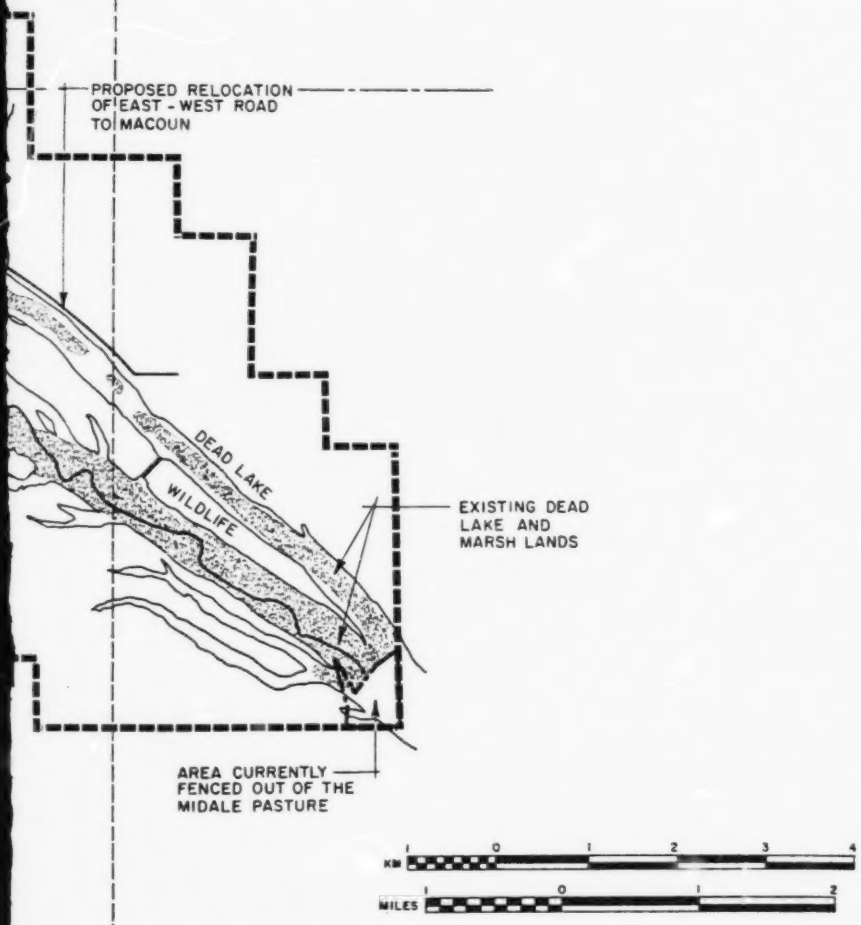
PROPOSED RELOCATION OF EAST - WEST ROAD TO MACOUN
DEAD LAKE WILDLIFE
EXISTING DEAD LAKE AND MARSH LANDS
AREA CURRENTLY FENCED OUT OF THE MIDALE PASTURE
KM 1 0 1 2 3 4
MILES 1 0 1 2

FIGURE 7

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SOURIS BASIN DEVELOPMENT AUTHORITY

RAFFERTY / ALAMEDA PROJECTS

RAFFERTY DAM
RESERVOIR
ENVIRONMENTAL IMPACT STATEMENT
MIDALE SDA
COMMUNITY PASTURE

| PROP | UNIT | SYST. | FUNC | SERIAL | REV |
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587 cattle from less than 10 km distance. Figure 5 indicates the residence location of Midale pasture patrons and the numbers of cattle delivered in 1986.

Impact:

The creation of the Rafferty Reservoir will inundate all of the Souris River Valley flood plain and the Dead Lake Channel southeast of Super Grid #606. It is the intention to retain approximately 5 km of the Dead Lake Channel through closure dams at #606 and at its north-westerly end near where it joins the Souris Valley (Figure 3). The primary purposes of retaining this portion of the Dead Lake Channel are for relocating Dr. Mainprize Regional Park, critical wildlife habitat protection and wetland/wildlife enhancement. When these facilities are developed in the Dead Lake Channel, they too would be fenced out of the Midale Pasture with a corresponding reduction of the carrying capacity.

Based on the current Rafferty project proposal with mitigation measures for Dr. Mainprize Park, wetlands and wildlife, approximately 1,024 ha (2,530 acres) of pasture land will be removed from the pasture. This includes 614 ha (1,517 acres) taken for the reservoir and the wildlife mitigation areas in the western Dead Lake Channel, 206 ha (509 acres) for the relocated Mainprize Park, 113 ha (280 acres) for a white-tailed deer aspen enhancement block along the northwestern boundary of the pasture, 73 ha (180 acres) of the most easterly two mile sliver of land between the Souris Valley and Dead Lake, for wildlife, and 18 ha (44 acres) for road relocations.

This loss of 1,024 ha (2,530 acres) represents a loss of 16 percent of the total land base of the pasture. In terms of carrying capacity, this could translate into a reduction of 184 cows or an average of 5 head per patron for thirty-seven patrons.

Unfortunately, most of this lost pasture will be from north of the Souris River where the majority of patrons trail their cattle to and from the pasture. Revisions to the pasture management will be required with alternative dry pastures designated, cross fencing and dugouts. During earlier discussions with some patrons, concern was expressed about cattle getting bogged down in silt along the newly eroding shoreline. The decision to fence the reservoir out of the pasture will alleviate this concern.

Accessibility to the pasture will not be significantly altered as #606 will be retained, but along a slightly different alignment just west of the Mainprize Golf Course and east of Elswick Lake where it crosses the smaller Dead Lake Channel. Additional trucking will likely be necessary for some cattle as the main #606 crossing will involve a bridge section.

In addition to improved management practices such as fertilization and possible irrigation, mitigation of pasture losses can be achieved through acquisition of adjacent lands for addition to the pasture. There are a number of quarter sections both north and south of the Souris Valley, southeast of the pasture which are crown land currently under private lease. Approximately sixteen quarters would have to be acquired to fully compensate the Midale Pasture for the lost land base.

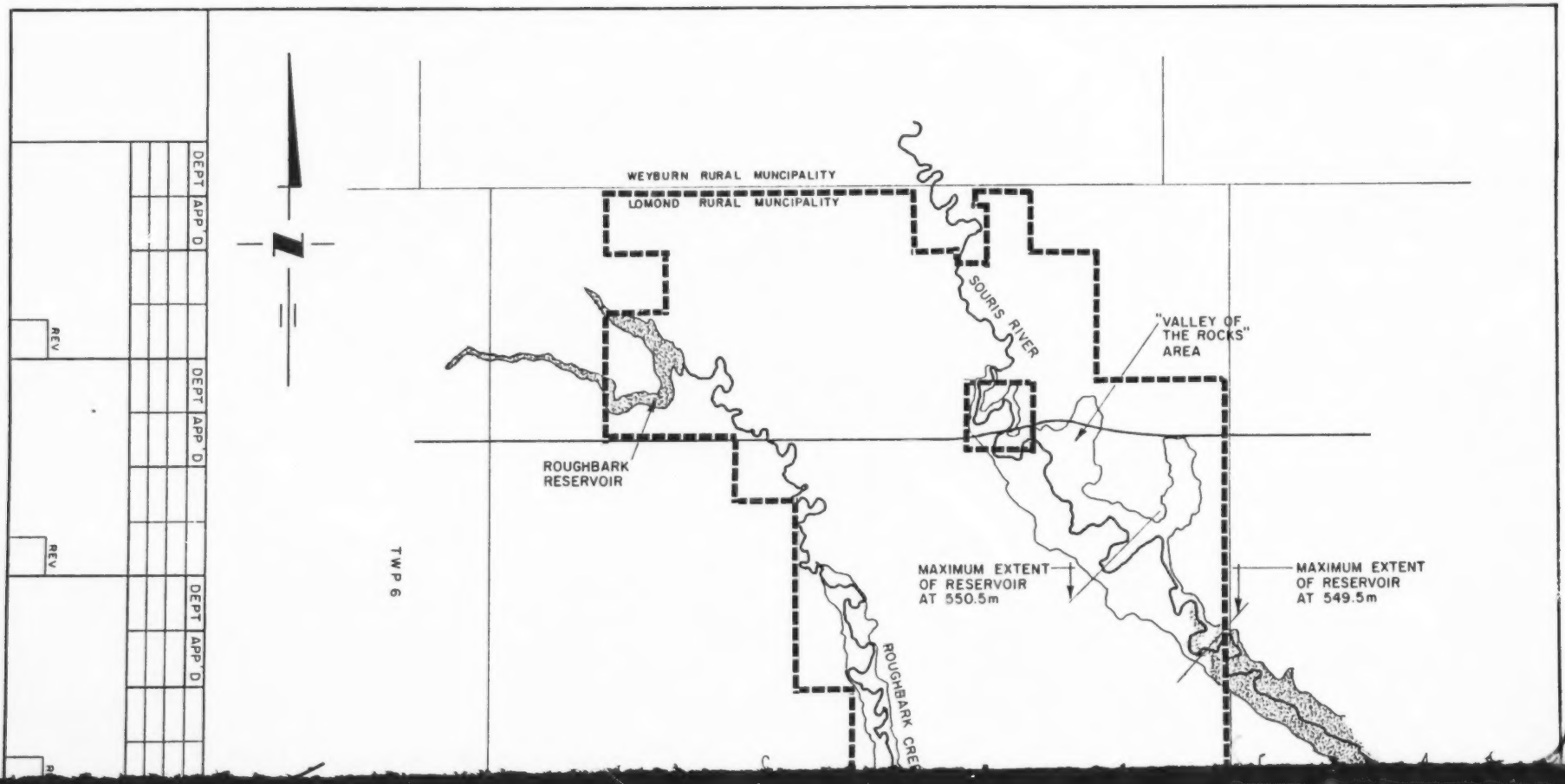
The Authority will commence negotiations for alternative pasture lands equal to the amount being lost immediately upon approval of the Rafferty Project. This land acquisition program will be co-ordinated with the land purchase for the actual Reservoir Management Area and renegotiation of crown land leases.

Mitigation Costs:

| | |
|---|---|
| - Fencing, dugouts | $100,000 |
| - Acquisition of 16 quarters of adjacent land @ $40,000 | 640,000 |
| | $740,000 |

2.3 Lomond #1 PFRA Community Pasture

The Lomond #1 pasture was established in 1938. It is a much larger pasture in the extreme northeast corner of the Rural Municipality of Lomond #37, east and north of Goodwater. The pasture contains, 9,465 ha (23,389 acres) of land in townships 5 and 6, Range 13, west of the 2nd Meridian. The main water courses in the pasture include the Souris River, Roughbark and Jewel Creeks. A stock watering and irrigation reservoir was created on Roughbark Creek in the extreme northwest corner of the pasture in 1937. Oil wells, batteries, flowlines, pipelines, power lines and maintenance access roads criss cross the majority of the pasture, co-existing with the pasture uses. Super grid #705, connecting Goodwater to Halbrite and Macoun on Highway 39, bisects the pasture east-west between the two townships (Figure 8).


WEYBURN RURAL MUNCIPALITY
LOMOND RURAL MUNCIPALITY
SOURIS RIVER
"VALLEY OF THE ROCKS" AREA
ROUGHBARK RESERVOIR
MAXIMUM EXTENT OF RESERVOIR AT 550.5m
MAXIMUM EXTENT OF RESERVOIR AT 549.5m
TWP 6
DEPT
APP'D
REV

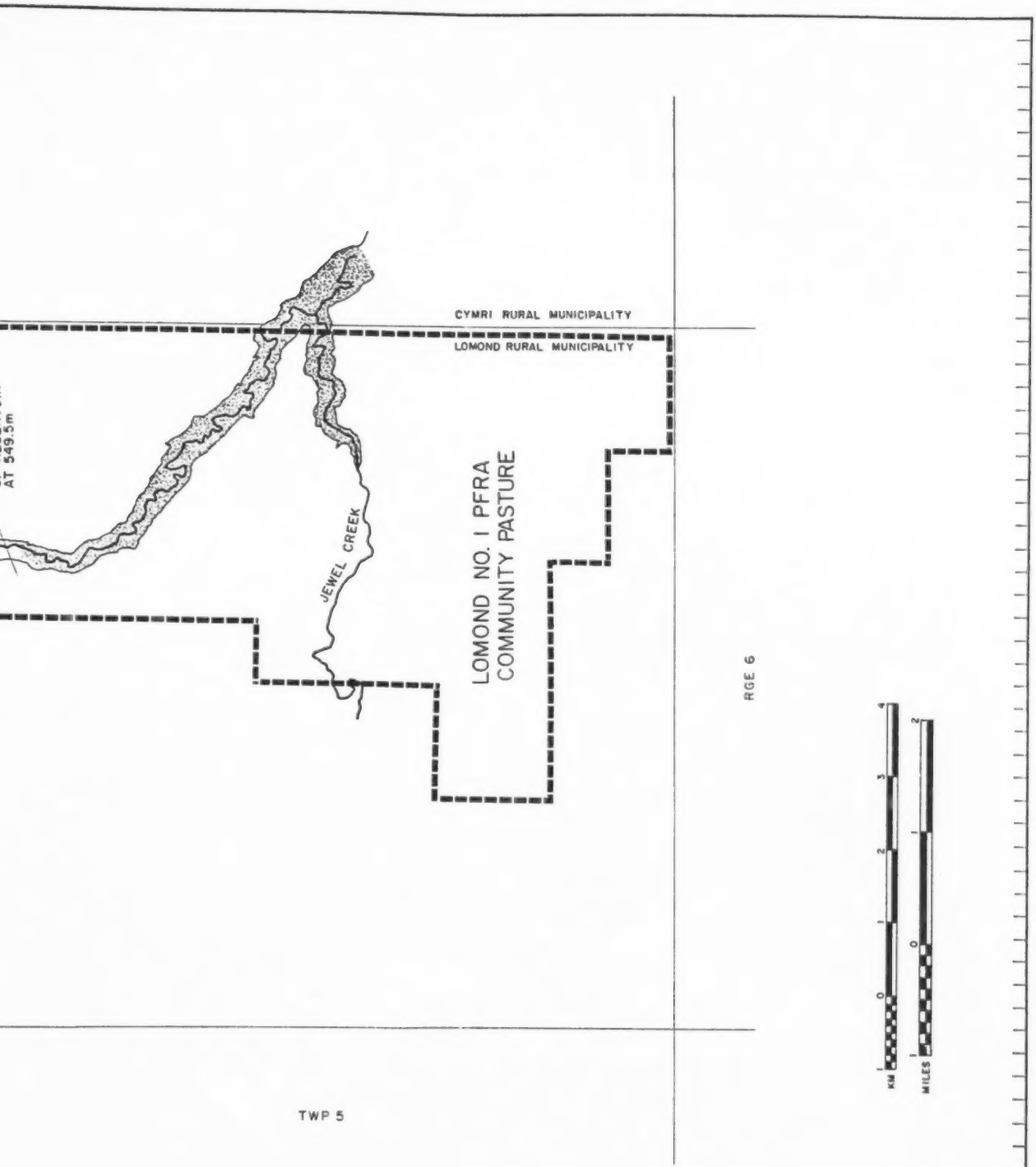



FIGURE 8

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SOURIS BASIN DEVELOPMENT AUTHORITY

RAFFERTY / ALAMEDA PROJECTS

RAFFERTY DAM

RESERVOIR
ENVIRONMENTAL IMPACT STATEMENT
LOMOND NO. 1 PFRA
COMMUNITY PASTURE

| PROP | UNIT | SYST. | FUNC. | SERIAL | REV |
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The pasture has an established long term carrying capacity of approximately 2,000 cows (with or without calves) on the 146 quarter-sections.

In 1986, thirty-seven patrons were permitted to graze 1,020 cattle, reflecting the lower stocking rate of approximately 4.5 cows/AUM due to the poor growing conditions. Ten patrons had 35 or more cattle in the pasture while another ten had 15 cattle or fewer. When growing conditions were at their best, more than sixty patrons have been permitted to graze 2,000 head.

In 1986, nineteen patrons from within the Rural Municipality of Lomond pastured 556 cattle, all originating within 10 km of the pasture (Figure 1). An additional 136 cattle were brought by three patrons within 5 kms of the northern boundary of the pasture. Virtually all of these cattle are 'trailed' to the pasture. North and east of the pasture, eight patrons brought 136 cattle from between 10 and 20 km. One patron brought cattle from beyond 20 km from the northeast and only one patron brought cattle from his farm east of the pasture and north of Midale. Five patrons brought 139 cattle from beyond 20 km south of the pasture.

Surprisingly, there were no patrons with cattle who resided more than 7 or 8 km west of the pasture. This indicates that this pasture is complemented well by other pastures to the west. The cluster of patrons in the Hume-Griffin area reflects the mixed farming in the more rolling topography and higher elevations.

Impact:

The Rafferty Reservoir, at the Initial Operating Level of 549.5 m will not inundate the Souris Valley flood plain within the Lomond #1 Pasture. The upper extent of the reservoir only reaches the eastern boundary of the pasture. The reservoir does, however, extend approximately 4.8 km into the pasture up the Roughbark Creek Valley and approximately 2 km up Jewel Creek at Full Supply Level.

It is proposed that lands on the Souris and Roughbark valley floors between Full Supply Level and Maximum Flood Level (554 m) be encumbered only by flood easement to enable pasture operations to continue. The use of flood easements will reduce the amount of land required by purchase. As within the Estevan-Cambria pasture, the reservoir boundary will be fenced to keep cattle away from the normal operating levels and the shoreline. Dugouts and cross-

fencing will be used to better distribute cattle within and throughout the pasture.

It is estimated that 840 ha (2,020 acres) will be acquired and fenced out of the pasture. This represents approximately 8.8 percent of the total pasture land base. (There may be an opportunity to lease much of this land back to PFRA for a period of time as there will be some time lag before the reservoir reaches FSL of 550.5 m.)

Approximately 500 ha (1,235 acres) will require flood easements within the pasture to accommodate potential floods above FSL up to the 554 m elevation. This land will continue to be used within the pasture.

While the land above Full Supply Level within the pasture may occasionally experience short term flooding, it is not considered to be significant in that such flooding will normally occur in the spring months before the growing season and before the land is required for pasture. Such short-term flooding may improve the carrying capacity on these flood plains much like short-term back flood irrigation of natural hay meadows.

As with the Estevan-Cambria and Midale pastures, perimeter and cross-fencing must be complemented with the establishment of dugouts and an updated pasture management plan to move cattle within the pasture. The loss of nearly 9 percent of the pasture will not have a severe impact on the carrying capacity of the pasture, nor upon the number of patrons which can be served. The Authority recognizes the importance of this pasture to local patrons, especially, and will attempt to acquire alternative lands to reduce the net impact on the pasture.

It is proposed to raise Primary Grid #705, the major access road to the Lomond #1 Pasture headquarters, so there will be no negative impacts from an accessibility point of view. The grid road west of Halbrite will not be affected by the reservoir even during flood conditions.

Mitigation Costs:

| | |
|---|---|
| - Fencing and dugouts, as required | $120,000 |
| - Land Acquisition | |
| 6 quarter-sections @ $40,000/quarter | 240,000 |
| | $360,000 |

## 3. SUMMARY AND CONCLUSION

Without mitigation, the combined impact of the reservoir on the three community pastures would be a carrying capacity loss of 531 cattle.

| Pasture | Lost Land | | Lost Capacity |
|---|---|---|---|
| Estevan-Cambria | 850 ha | - | 170 cattle |
| Midale SDA | 1,024 ha | - | 184 cattle |
| Lomond #1 PFRA | 840 ha | - | 177 cattle |
| | TOTAL | | 531 cattle |

This represents a reduction of 14.4% from the current combined carrying capacity of 3,675 cattle for the three pastures. With ninety patrons served in 1986, a 14.4% reduction could mean the potential elimination of thirteen patrons. With requests for grazing already exceeding current stocking rates, this loss could be critical. The alternatives of improved management practices and acquisition of replacement lands therefore will be pursued by the Authority.

While the carrying capacity of the three pastures is currently 3,675 cows (with or without calves) the current extended drought has reduced the stocking rates to 2,442 cows, a drop of 1,233 head or 33.5 percent. Although this reduction is temporary, rather than permanent as with the loss of land to the Rafferty Reservoir, it is nevertheless, very severe in terms of effect on local farmers and ranchers. This temporary reduction in current grazing capacities due to drought is more than twice as severe as would be lost due to the creation of the Rafferty Reservoir. In fact, using the current stocking rates for the three pastures, the lost land bases for each would translate into lower stocking of Estevan-Cambria pasture by 143 head, Lomond #1 by 90 head and Midale SDA by 146 head for a total reduction of 379 cattle. This number of cattle (379) is approximately equal to the number now being trucked to the three pastures from beyond 20 km radii. In other words, local patrons need not be negatively affected at all if more distant patrons could be accommodated elsewhere, closer to their farms. This possibility will be pursued further by the Authority as one possible means of mitigating the impact of Rafferty Reservoir. With the reduced grazing rates due to the drought conditions

throughout the Study Area, it will be very difficult to turn away patrons who bring cattle great distances.

In conclusion, the loss of some community pasture lands will not be severe relative to the long-term impact of droughts in the Study Area during which stocking rates must be cut dramatically. Although there is no documented evidence available, creation of the reservoir may result in localized increases in precipitation and decreased evaporation and evapo-transpiration, resulting in long term increases in carrying capacities and stocking rates. This, combined with improved rangeland management and possible irrigation and fertilization, may ameliorate the actual losses of the land bases in the pastures to be affected by the Rafferty Reservoir while reinforcing producer confidence in cattle production by providing reliable feed and less vulnerability to drought.

In order to minimize the impact of the Rafferty project on the pastures, the Authority will attempt to replace the lost land base through acquisition of suitable adjacent lands. Some Crown Lands already under grazing lease could be added to the pastures over the long term when current lessees terminate their use of the land. Other private land owners may prefer to dispose of land for inclusion in the pastures. The Authority will commence discussions with PFRA, Saskatchewan Agriculture and the patrons themselves as soon as project approval is received in order to arrive at a rationalized solution to the problems identified.

## ALAMEDA PROJECT AREA

### .1 Agricultural Land Use in the Alameda Project Area

Land use within the area to be affected by the Alameda Project reflects the main agricultural practices of the area. Unlike the Rafferty Project Area where provincial crown lands and three community pastures are located, the Alameda area involves almost all deeded lands.

Two large maps inside the back cover illustrate the settlement pattern and rural road development in the Alameda Project Area (Figure 8a) and land ownership (Figure 8b).

As illustrated in Table 12, the major use of the Moose Mountain Creek valley is cattle grazing (1,555.7 ha), hay production (104.7 ha) and crops

TABLE 12

Major Land Uses of Areas within the Proposed Alameda Reservoir
(579 m) Flood Control Level

| Land Unit/Type | Area (ha) | Major Use |
|---|---|---|
| Open water | 141.4 | Waterfowl/wildlife |
| Typha marsh | 6.5 | Cattle grazing and |
| Graminoids/forbs/shrubs | 292.8 | wildlife lands |
| Trees/tall shrubs | 62.2 | |
| Grasslands | 190.0 | Cattle grazing and |
| Grass/shrubs | 1,004.2 | minor wildlife use |
| Haylands | 104.7 | Hay production |
| Crops | 76.0 | Cereal Crop Production |
| Disturbance Areas (gravel pits/roads, farmyards) | 4.2 | Gravel extraction, Transportation, Farmyards |
| TOTAL: | 1,882.0 | |

Source: Souris Basin Development Authority Background Report 1986

(76.0 ha). Very little of the valley is not used for agricultural production but precise areas have not been calculated. More detailed information on land use in the Alameda Project Area will be provided to Saskatchewan Environment when it becomes available later this year.

Rafferty Project Land Assembly and Reservoir Management Area

All lands to be flooded by the reservoir will be acquired by the Souris Basin Development Authority on behalf of the Saskatchewan Water Corporation through an integrated land management acquisition process. The amount of land to be acquired will be determined by establishing the location of the Full Supply Level, estimating the long-term shoreline erosion and sloughing and adding a buffer zone to protect against unforeseen contingencies. The resulting line will establish the minimum amount of land needed from each parcel. The actual amount of land severed from each owner parcel will be determined by examining the specifics of each situation. Entire parcels will be acquired where severence does not leave an economic parcel to the landowner. Additional lands slated for wildlife habitat enhancement, public access and future recreational development will also be acquired through this integrated land acquisition process.

The acquisition of lands for the reservoir will require an extensive amount of effort in determining the parcels required for various purposes and in negotiating the amount to be severed, if any, and the price to be paid. The precise amount of land to be acquired is not known at this time and will not be until discussions commence with the land owners, however an estimate has been made.

Table 13 summarizes these estimates, by Rural Municipality and landowner category. Note that with the higher Full Supply Level (551.5 m) associated with the earlier proposed dam site (4 km upstream), the upper reaches of the reservoir would have extended into the Rural Municipality of Weyburn #67. With the relocation of the dam to site C and the lower Full Supply Level of 550.5 m, the reservoir will not affect that Rural Municipality.

For purposes of discussion, the land which will be acquired has been termed the Reservoir Management Area. During the construction period, these lands will be managed by the Souris Basin Development Authority on behalf of the Saskatchewan Water Corporation. The long-term management options for these

TABLE 13

PROPOSED LANDS WITHIN RAFFERTY MANAGEMENT AREA IN HECTARES (ACRES)

| Land Owner | R.M. of Estevan #5 | R.M. of Cambria #6 | R.M. of Cymri #36 | R.M. of Lomond #37 | Total | % |
|---|---|---|---|---|---|---|
| Provincial Crown Under Lease | 825.6 (2,040) | 1,295 (3,200) | 1,319.3 (3,260) | - | 3,439.9 (8,500) | 27.4 |
| Midale SDA Community Pasture | - | - | 2,994.7 (7,400) | - | 2,994.7 (7,400) | 23.8 |
| Estevan-Cambria PFRA Community Pasture | 744.6 (1,840) | 97.1 (240) | | | 841.7 (2,080) | 6.7 |
| Lomond #1 PFRA Community Pasture | - | - | - | 841.7 (2,080) | 841.7 (2,080) | 6.7 |
| Private Ownership | 1,618.8 (4,000) | 1,286.9 (3,180) | 1,537.8 (3,800) | - | 4,443.5 (10,980) | 35.4 |
| TOTAL | 3,189 (7,880) | 2,679 (6,620) | 5,851.9 14,460 | 841.7 (2,080) | 12,561.7 (31,040) | 100.0 |
| Percent | 25.4% | 21.3% | 46.6% | 6.7% | 100.0% | |

lands are addressed in the following section (Reservoir Development and Management Planning). Figure 9 illustrates the proposed Reservoir Management Area which will be reviewed with the various Rural Municipalities and affected landowners.

Of the potential area to be acquired 4,678.3 ha (11,560 acres) or 37.2 percent is located within the three community pastures. 23.8 percent of this is within the Midale SDA pasture and the balance, 13.4 percent is split evenly between the Estevan-Cambria and the Lomond PFRA pastures. A significant segment of the Midale community pasture portion is located between the main Souris Valley and the Dead Lake Channel to the north. It is proposed to acquire this entire 'hogsback' although 500 to 600 ha could continue to be utilized for grazing of cattle. It should also be noted that much of this area is already not utilized for grazing of cattle; it includes the hay plots along the floor of the Souris Valley, Dr. Mainprize Regional Park, Dead Lake and a number of other water bodies and wetlands. Approximately 730 ha of the gross pasture acreage is actually not within the current grazing area. It has nevertheless been included within the overall reservoir area. McDonald Lake has similarly been included within the Estevan-Cambria PFRA pasture and the adjacent provincial crown lands.

In addition to the Midale pasture lands, 3,439.9 ha (8,500 acres) of provincial crown lands under agriculture lease will be acquired (Table 13). This represents 27.4 percent of the total Reservoir Management Area All provincial crown lands therefore comprise 51.2 percent of all lands required for the Rafferty Project.

4,443.5 ha (10,980 acres) of private land will be acquired, 1,618.8 ha in the Rural Municipality of Estevan, 1,286.9 ha in the Rural Municipality of Cambria and 1,537.8 ha in the Rural Municipality of Cymri. Only PFRA community pasture land is required in the Rural Municipality of Lomond.

The total proposed purchase area of 12,561.7 ha (31,040 acres) is approximately thirty percent less than that originally estimated for the Rafferty Project with the higher reservoir elevations. Original estimates also assumed that all lands would be purchased up to the Maximum Flood Level of 555 metres.

It has been determined that the Authority will not require ownership of land in the upper reaches within the Lomond #1 PFRA pasture; flood easements

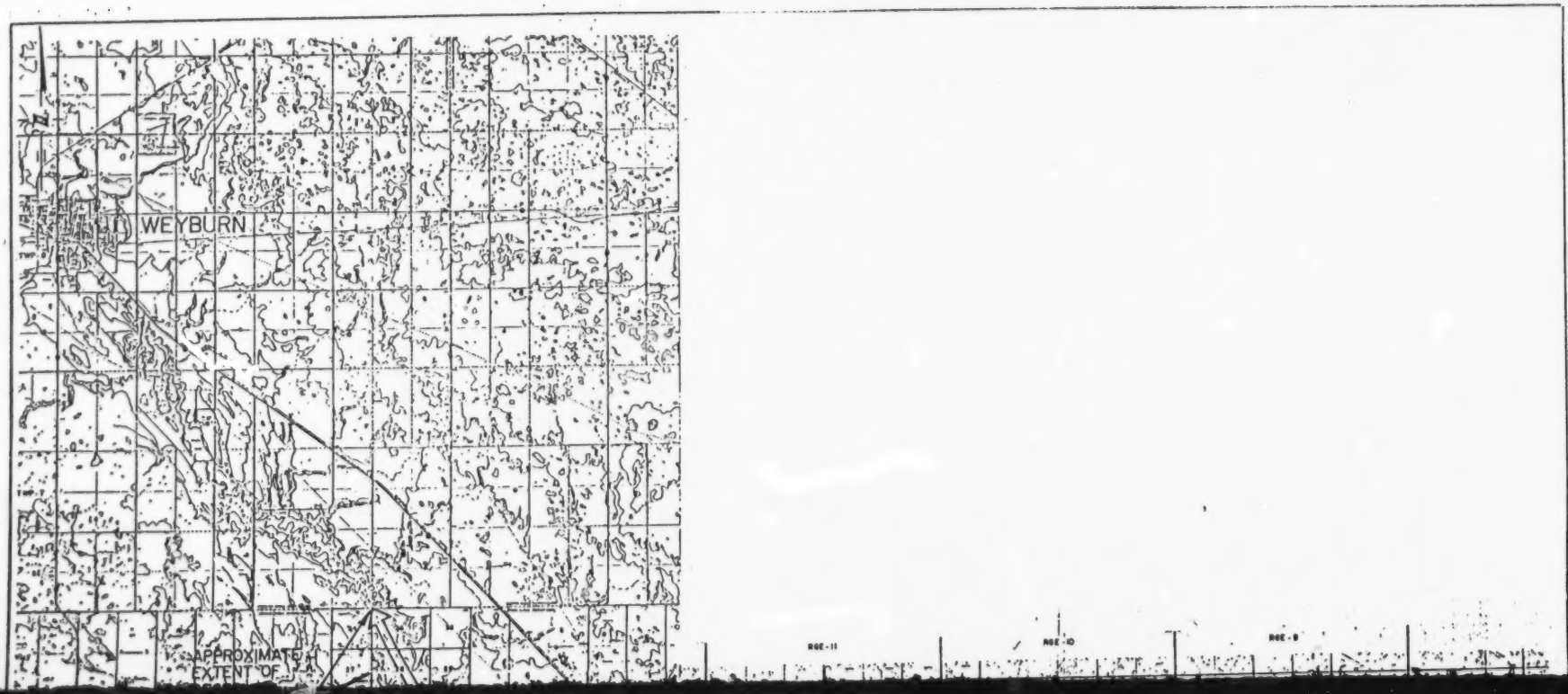
WEYBURN
APPROXIMATE
EXTENT OF
RGE-11
RGE-10
RGE-9

FIGURE 9

SOURIS BASIN DEVELOPMENT AUTHORITY
RAFFERTY / ALAMEDA PROJECTS
RAFFERTY DAM
RESERVOIR
ENVIRONMENTAL IMPACT STATEMENT
LAND PURCHASE BOUNDARY LINE

will be negotiated and registered for those parcels subject to periodic flooding when the reservoir is permitted to surcharge to temporarily hold peak runoffs.

As shown in Table 13, the greatest amount of land required for the project (46.6%) is within the Rural Municipality of Cymri. This is equivalent to that required from the Rural Municipalities of Estevan and Cambria combined. Only 6.7 percent of the total area is within the Rural Municipality of Lomond.

It should be emphasized that the total area of 12,561.7 ha includes land deemed essential to the project for a number of purposes: water management; land management and public safety; relocated access roads and causeways; boat launch and public access points; parks and recreation areas; a number of wildlife preserves; wetlands and cottage areas. As a multiple objective project, the Authority will develop a long-term Reservoir Management Plan recognizing the various interests in and uses for the land surrounding the Reservoir. The local municipalities will be fully involved in the preparation of the Management Plan for these lands.

The Souris Basin Development Authority has approved a land acquisition policy which sets out the evaluation procedures and pricing policies which will be used. The formula to be applied in establishing sums paid for the lands required includes compensation for: bare land; unplanned sale; disruption; and a payment in lieu of leaseback. The payment for bare land is based on a market value per acre determined by reconciling two independent appraisals. The payment for an unplanned sale is established at 3.1 times the assessed value per acre times the number of acres. The payment for disruption will be $75.00 per acre plus $1.27 per acre for each $100.00 of assessment per quarter section. In situations where landowners cannot be given five years notice before the land is required an additional per acre payment in lieu of leaseback is to be paid for each year short of five years. This payment will be $8.00 per acre per year for pasture and $10.00 for cultivated acres. Additional compensation values for fences or buildings will be negotiated with respective owners. Four farmsteads are involved in the Rafferty Project Area and one at Alameda.

This approach results in a total compensation package which can be 70 percent to 80 percent above current market values. A similar purchase policy has been successfully utilized elsewhere by the Saskatchewan Power

Corporation. It has been generally recognized as fair and equitable compensation to landowners, permitting them to acquire alternative lands to satisfactorily adjust their farming operations. The application of this method to hypothetical land parcels was illustrated for the public at the Rafferty/Alameda Open Houses in 1986. There was no observable or recorded negative response to the policy proposals at that time, hence it was deemed to be acceptable to the public and suitable for adoption by the Authority. As well the Policy has been explained to a number of landowners who will be affected by the Project without any noted negative response.

SUMMARY

The Rafferty Reservoir will flood lands currently used for a variety of agricultural purposes. Based on the cultural and ecological land type, aerial photo interpretation and classification (Tamarack Environmental Consultants, 1986), 10.7 percent of the land to be flooded is now used for cereal crop production, 24 percent for forage crop and hay production and the majority, 48.1 percent is used for grazing of cattle. Approximately 17 percent is currently not used or capable of being used for agricultural purposes.

As indicated in the Community Pasture Mitigation Section of this Environmental Impact Statement, losses to the pastures will be mitigated, through acquisition of alternative lands and/or a combination of pasture management revisions. Actual losses to the community pastures in terms of carrying capacities will vary considerably.

The type of land use in the valley reflects the natural characteristics of the land. The valley itself has steep, rocky slopes suitable only for extensive cattle grazing and wildlife. The floodplain is more useful for agricultural endeavors. In the reaches above the Estevan-Cambria pasture it is somewhat higher and better drained, lending itself to cultivation. In the lower reaches, the floodplain is low and poorly drained, subject to flooding and periods of inundation, thereby limiting agricultural capability to production of perennial forage crops.

Precise calculations of land use, by type, will vary from year to year. During and following a series of wet springs and summers for example, cereal crop and hay crop production are reduced; many acres of the valley floodplains

are inundated reducing the growing and frost-free periods for cereals and making some lower haylands inaccessible.

Figure 4 illustrated the current distribution of haylands and cultivated crop lands in the Souris Valley. Approximately 24 private land owners will lose cereal crop and haylands on the floodplains of the Souris Valley and Roughbark Creek. In addition, a number of provincial crown land lessees will have to surrender their leases, they will be compensated. All landowners will be compensated for their land, including disruption allowances and payment for improvements such as fencing. The Authority has approved a land acquisition policy which sets out the evaluation procedures and pricing policies which will be used.

As stated in the Acquisition Policy, some private agricultural landowners will have options as to the time of actual sale, payments in lieu of leaseback, and whether additional adjacent lands would be offered for sale due to disruption of the farm/ranch operation. Some farmers near retirement age might choose to sell additional land to the Authority if the farm unit is severely disrupted. This land may subsequently be resold to another farmer or traded for land on the other side of the reservoir to consolidate another farmers landholdings. For these lands, the land acquisition policy will not apply and a market value assessment will be negotiated with the landowner. Similarly, crown land lessees may choose to consolidate leased land on one side of the reservoir or the other. As it cannot be predetermined what the actual preference or decision of each landowner or lessee will be, it is not possible to quantify the actual disruption to farm units throughout the length of the reservoir.

Concern has been expressed regarding elimination of existing roads across the valley which might render various parcels of land on one side of the reservoir inaccessible to the landowner on the opposite side. This concern was based on the assumption that existing roads would not be replaced and that present land ownership would remain constant. The Authority is committed to retaining Super Grid Roads #606 and #705 in the upper reaches of Rafferty, and to providing a new crossing between Highways 18 and 39 across the Rafferty dam. The very high costs of construction ($12.5 million) and low volumes of average daily traffic on the road between Macoun and Outram (40 vehicles per day) do not warrant a causeway there. Having thus removed that concern, the Authority

notes that the pattern of land ownership is never constant; people buy and sell property for a variety of reasons over their lifetimes. Social and economic factors are continuously at work throughout rural Saskatchewan reflecting changes in road patterns, land prices, farm commodity prices, urbanization forces, age and family structure composition and many other private factors. Creation of reservoirs such as Rafferty and Alameda represent an accelerated re-structuring of the land base which reflects new opportunities and constraints to landowners and lessees. A young newly established farmer may view the project as a serious disruption to the status quo while an older, near retirement farmer in the same situation may view the circumstances as an opportunity to alter one's lifestyle.

Adequate and 'fair' compensation to private landowners and lessees will ameliorate social costs of the project, resulting from land use disruption. The Authority will endeavor to have adequate grazing land provided on one side of the reservoir or the other, to ensure that no real cost from an agricultural point of view must be borne unfairly. The transition or adjustment period need not cause undue hardship to individuals in either the short-term or the long-term. Lands actually lost to the reservoir will be a loss to agriculture, but the industry will acquire net benefits derived downstream through new irrigation and farming opportunities.

## RAFFERTY RESERVOIR DEVELOPMENT AND MANAGEMENT PLANNING

Reservoir development will have a number of long term impacts on the Souris River Valley. With the establishment of the reservoir, tourists and recreationists will be attracted to the area and demands for public recreation areas, cottage sites, country residential and retirement homes will emerge. Some of these demands and subsequent land uses will tend to conflict with existing land uses. A reservoir development and shoreline management plan should recognize the flora, fauna, and existing and potential land uses around the reservoir.

The Authority recognizes the short and long-term impacts to the surrounding lands and the Rural Municipalities. The Rural Municipality of Estevan #5 has an existing District Zoning bylaw but the Rafferty Reservoir will extend many kilometers north-westward through portions of the Rural

Municipalities of Cambria #6, Cymri #36 and Lomond #37 where there are no zoning bylaws. The reservoir will not have a direct impact upon any lands in the Rural Municipality of Weyburn #67 which also has a zoning bylaw.

While it is the intention of the Authority to purchase all land required for the actual reservoir and related mitigation measures, plus a peripheral buffer strip, there will be a need to control undesirable land uses and activities adjacent to the reservoir. In order to maximize the long-term recreational and tourism potential of the reservoir, including wildlife populations and habitat, archaeological resources, afforestation blocks, public access points, routes or trail systems, and reduction or elimination of certain land use conflicts between land owners and visitors, restrictions and approved development within specified zones is required.

The Rural Municipalities have different options and degrees of potential involvement in the Reservoir Development and Management Planning process. The best option for Rafferty will involve an analysis of the advantages and disadvantages of each option from the point of view of the municipalities, the land owners, provincial departments and agencies such as Saskatchewan Water Corporation, Saskatchewan Environment, Saskatchewan Power Corporation and the Souris Basin Development Authority. It may be desirable to initially establish appropriate management and development controls utilizing one of the options (such as a Reservoir Development Area) then, over time, adopt one of the other options (such as a Planning District or Valley Conservation Authority) with greater local input and control. With three of the four Rural Municipalities having had neither need for nor experience with the administration of a zoning bylaw, and with the majority of the adjacent land being provincially owned and the reservoir serving a variety of regional, provincial and international needs, it would seem unreasonable to burden these Rural Municipalities with sudden and significant resource management responsibilities.

Section 120 of The Planning and Development Act (1983) permits the councils of two or more municipalities to enter into an agreement providing for the establishment of a Planning District. The Minister responsible must approve such an agreement and may direct the participating municipalities (the District Planning Commission) to prepare a district development plan with complementary zoning controls. An example of municipalities undertaking

District Planning can be seen at Codette Lake where the Rural Municipalities of Torch River and Nipawin are cooperatively undertaking the responsibilities.

Unlike the majority of municipalities in the Rafferty area, the two Rural Municipalities at Nipawin had previous interests, needs and experience in district planning, (with the town of Nipawin), giving them a good advantage to oversee the preparation of a development and management plan. Codette Lake's operating plan is not as complex as the one proposed for Rafferty Reservoir where multiple uses and coordination with a number of other reservoirs in the Souris Basin are required (Boundary and Alameda Reservoirs and Lake Darling north of Minot, North Dakota).

A second option, under the Environmental Management and Protection Act, allows the Minister of Environment to designate a Reservoir Development Area (RDA) surrounding a reservoir.

The RDA process and program has been utilized a number of times including at Lake Diefenbaker and Blackstrap Reservoir southeast of Saskatoon. The RDA process was specifically designed to address reservoirs and the particular circumstances and problems associated with such bodies of water.

As described in the Act and the accompanying Reservoir Development Area Regulations, the legislation is designed to ensure orderly development and land use around a reservoir, to provide for the safety and security of all who use the reservoir, and to accommodate the various uses which may locate near a reservoir, such as recreation, agriculture, cottages, institutional camps, public access, commercial and industrial.

The legislation prescribes a process which includes the preparation of land use plans and background studies, consultation with the Rural Municipalities, the publication of notices and the holding of public meetings. The submission of an Order-in-Council is required to designate an RDA.

When an RDA has been established, a Plan showing Land Use Districts is prepared in consultation with the municipalities and appropriate regulations are put in place to implement the various Districts and zoning controls. Prior to a development taking place, a permit must be obtained from Saskatchewan Environment. The process is highly flexible, and it can be tailored to meet the needs of municipalities that wish a high degree of involvement in the administration of the area, as well as those municipalities which do not. The municipalities are involved in delineating the RDA boundaries and in

administering a zoning bylaw under the Environmental Management and Protection Act, if they wish.

At the Lake Diefenbaker and other RDA's restricted building areas are in effect immediately surrounding the reservoirs, but the Reservoir Development Area boundaries usually extend much further from the shorelines, often to protect agricultural and other existing land uses from conflicting and undesirable uses attracted by the new reservoir.

The Souris Basin Development Authority will discuss the foregoing and other possible management options with the affected municipalities in order to clarify the advantages and disadvantages of each, and to permit the municipalities to indicate their most desirable alternative. Short-term and long-term resource management needs and opportunities will be considered as well as the needs of other government agencies and departments. Each department or agency with identified interests in the Rafferty Project will be requested to provide their recommendations for optimum land uses, development controls and resource management options for subsequent discussions with the rural municipal councils and the Authority.

## ALAMEDA RESERVOIR DEVELOPMENT AND MANAGEMENT PLANNING

As discussed above with respect to the Rafferty Reservoir, the Authority will evaluate the possible options with the affected municipalities. This issue will be further addressed upon completion of the additional baseline data gathering and analyses of the results. Saskatchewan Environment will be advised as to any additional specific recommendations at that time.

## SOURIS BASIN PLANNING CONSIDERATIONS

As a complex multi-purpose project with long-term water and land management implications, attention must be given to the development and implementation of an integrated basin management plan. The elements of such an overall plan involve the reservoir operating plans, wildlife enhancement and mitigation plans, fisheries management plans, downstream ecosystem protection and management, land uses and administration and responses to social and economic needs of the people in the basin. Many

of these elements will be in place following completion of the projects, but there will be a continuing need to integrate these elements over the long term.

There are many concerns of interest groups and legislated agency responsibilities which must be brought together in the planning process. These include local interests by landowners and the municipalities involved and special interest groups such as the Saskatchewan Wildlife Federation, Ducks Unlimited Canada and the Saskatchewan Natural History Society. In addition to the Souris Basin Development Authority's initial short term mandate, provincial responsibilities are represented by the Saskatchewan Water Corporation, Saskatchewan Environment, Saskatchewan Agriculture, Saskatchewan Parks, Recreation and Culture, the Saskatchewan Power Corporation and others. With such a diversity of interests and responsibilities, development of a long term integrated basin management plan will take time, effort, cooperation and understanding. The task is neither simple nor quickly completed but it is necessary, achievable, and very worthwhile.

As indicated in the Land Use section of this Statement, it is suggested that Reservoir Development Areas should be established around the Rafferty and Alameda reservoirs. Future inclusion of the Boundary Reservoir on Long Creek would also be appropriate to achieve greater uniformity in dealing with the overall Souris Basin management objectives. The existing Boundary Reservoir would appear to be a good example of the results of no overall management plan. There is confusion amongst the public as to the responsibilities of Saskatchewan Power Corporation, Saskatchewan Parks, Recreation and Culture, Saskatchewan Water Corporation, the Rural Municipality of Estevan and the Estevan District Planning Commission. Responsibilities for land and water use controls and development around the reservoir are not clearly defined.

This Environmental Impact Statement has attempted to identify and deal with the potential environmental and economic impacts of the Project. Specific mitigation plans have been described in the wildlife, fisheries, land use, mineral resources, transportation, recreation, heritage resources and other sections. Short term and long term

monitoring requirements are also addressed. As the Authority's current mandate is limited to the planning, design and construction of the dams, reservoirs and related appurtenances, many of the monitoring and mitigation efforts must become the commitments of a subsequent responsible agency. An administrative body with longer term responsibilities must follow this current mandate of the Authority. It would be inappropriate to specify the structure of such a subsequent administrative body at this time without the direct input of the local municipalities, interest groups and other government agencies. Creation of such a body must necessarily follow the decision to proceed with the Project and follow through with the various mitigative and monitoring activities. Clearly it must become the responsibility of an agency with a long term mandate to integrate the reservoir operating plans, the various mitigation plans, land use controls, and public and private developments into a comprehensive Souris Basin Management Plan. The purpose of the plan will simply be to integrate predicted water demands and flood control requirements with optimal ecosystem management and optimal economic development in the Saskatchewan portion of the basin area. At this point in time, the Authority can do no more than recognize these long term needs and, as proponent of the Project on behalf of the government, commit the government to developing an appropriate administrative body which will adequately respond to these needs.

MAPS NOT

FILMED

CARTES

OMISES